The Contradictions of Environmental Statehood

Air Pollution and Environmental Policy in Delhi and the National Capital Region, India

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Air pollution kills an estimated seven million people per year according to the World Health Organization – people living in the cities of low- and middle-income countries being the one's most exposed to toxic air. As rapid urbanisation continues to dominate the demographic trends in the developing world into the foreseeable future, so will the negative consequences of air pollution. This, coupled with the intense pressure for developing economies to prioritise rapid and unadulterated growth as a mean to raise the living standards of their citizens over the environmental consequences of that growth, will almost invariably make air pollution one of the leading causes of death in the world, if it is not already. This thesis analyses environmental policy around air pollution to not only understand the policies and their effectiveness, or ineffectiveness, but also their rationality regarding the wider economic activities in the background.

The study examines (state´s) air pollution abatement efforts in Delhi and the National Capital Region concerning the four primary sources of particulate matter in Delhi´s air: vehicular emissions, industries, dust, and crop burning. The research approach is based on policy analysis while the theoretical framework leans on political ecology. More specifically, the theoretical starting point is in urban political ecology, and political ecology of the state as per Antonio Ioris (2014), the former being built upon Marxist historical materialism, while latter is found upon a Marxist analysis of the (capitalist) state. The research aims to answer two questions: Does the quality and nature of Delhi´s environmental action correspond with Antonio Ioris' theory of the environmental (capitalist) state; and second, to what extent do state interventions fail to address, further, or even create environmental issues due to the contradictory positions they hold with respect to accumulation and environmental protection.

The main findings of the study follow the claims of Antonio Ioris about environmental statehood: the nature of state interventions concerning air pollution in Delhi and the National Capital Region have largely been ineffective, temporary, provisional, and partial. Furthermore, the failure to address the issue effectively obligates the Delhi government to declare air pollution emergency every winter during the worst pollution months in late October and November, introducing increasingly ad hoc - and drastic - measures that cascade up in accordance with the toxicity levels. From increasing parking tickets prices and banning diesel generators, to closing schools, banning all heavy vehicles, and prohibiting construction. Not coincidentally, the main source of air pollution during this worst period of the year is crop burning, a practice that has its roots in state legislation curbing water use in the neighbouring states of Punjab and Haryana, as well as in state procurement policies that promote the unecological farming of rice in the northern plains of India. And so, the state has not only been ineffective in curbing air pollution in Delhi but has also played a part in bringing about the situation in the first place.

The case of Delhi´s air pollution gives valuable insight into the contradiction the modern state finds itself when trying to balance between its two opposing responsibilities: the first as the one creating the best conditions for economic growth, and the other as the entity regulating and mitigating the environmental consequences of this growth. It is likewise yet another sobering instance of contemporary green action, where environmental action is rationalised though and out while maintaining irrationality in the assessment and conceptualisation of the issue the mitigation action is supposed to address in the first place, leading to environmental policy that is dislocated from the root cause of the issue. The inherent issues of state environmental policy highlight the need for more focus not only on the state policy itself, but on the rationality and commitment behind those policies. The Indian Democracy similarly offers a resolution by being able to exert pressure on state entities for more meaningful mitigation action. To make this happen, there needs to be an available and open real-time monitoring information on the pollution levels to empower the local residents and organisations to not only be able to point out the local pollutants in their areas and understand the health hazard these emissions are exposing them to, but also to be able to effectively direct action and demands towards the local, state, and federal representatives for meaningful environmental action to happen.

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Tiivistelmä – Referat – Abstract

Maailman Terveysjärjestön mukaan ilmansaasteet tappavat vuosittain noin seitsemän miljoonaa ihmistä. Ilmansaasteelle altistuvat eniten ihmiset, jotka asuvat pieni- tai keskituloisten maiden kaupungeissa. Niin kauan kuin kehitysmaiden väestönkehitystä hallitsee nopea kaupungistuminen lisääntyvät myös ilmansaasteiden kielteiset seuraukset. Ilmansaasteista on tulossa yksi maailman yleisimmistä kuolinsyistä osakseen kehitysmaiden väestönkehityksen vuoksi, mutta myös koska kehitysmaat kokevat painetta luoda pohja joutuisalle sekä sääntelemättömälle talouskasvulle, jossa elintaso kasvu asetetaan ympäristöseurausten edelle.

Tässä opinnäytetyössä analysoidaan ilmansaasteita koskevan ympäristöpolitiikan suhdetta ympäristötoimiin, sekä niihin vaikuttavan taloudellisen toiminnan järkevyyttä. Tutkimuksessa tarkastellaan Intian pääkaupungin Delhin sekä laajemman pääkaupunkiseudun ilmansaasteiden vähentämistoimia, jotka kohdistuvat alueen neljään pienhiukkasten ensisijaiseen lähteeseen: ajoneuvojen päästöt, teollisuus, pöly sekä satojen polttaminen. Teoreettinen lähtökohta tälle opinnäytetyölle on kaupunkipoliittinen ekologia sekä valtioiden poliittinen ekologia. Ensimmäinen pohjautuu marxilaiseen historialliseen materialismiin, taas kun jälkimmäinen on rakennettu marxilaisen valtioanalyysin päälle. Opinnäytetyön metodologia nojaa toiminnan analyysiin, taas kun teoreettinen kehys muodostuu poliittisesta ekologiasta. Tutkimus pyrkii vastaamaan kahteen kysymykseen: vastaako Delhin ympäristötoimien luonne ja laatu Antonio Ioriksen kuvaamaa teoriaa valtion poliittisesta ekologiasta, ja yleisemmin, missä määrin valtion toimet eivät kykene käsittelemään, pysäyttämään taikka ratkaisemaan ympäristöongelmia johtuen niiden ristiriitaisesta asemasta talouskasvun ja ympäristösuojelun suhteen.

Tutkimuksen tärkeimmät havainnot kohtaavat Antonio Iorisin ympäristövaltiota koskevien väitteiden kanssa: Delhin ja pääkaupunkiseudun ilmansaasteita koskevien valtion toimenpiteiden teho on suurelta osin ollut olematon, väliaikainen tai osittainen. Lisäksi ilmansaastetilanne pakottaa Delhin hallituksen julistamaan ilmanlaatuhätätilan joka talvi pahimpien saastekuukausien aikana, ja pakottaa valtion ottamaan käyttöön tilapäisiä sekä kovia toimenpiteitä. Pysäköintisakkojen korottamisesta koulunkäynnin perumiseen sekä kaikkien raskaiden ajoneuvojen liikennöinnin ja rakentamisen kieltämiseen. Suurin saasteiden lähde pahimpina ilmansaasteaikoina on kuitenkin sadon polttaminen, joka juontaa juurensa valtion lainsäädäntöön: vedenkäyttöä rajoittavat maaperälait Delhin naapuriosavaltioissa Punjabissa ja Haryanassa sekä valtion hankintapolitiikka samoissa osavaltioissa, edistävät riisin epäekologista viljelyä ja satojen polttamista Intian pohjoisilla tasangoilla. Valtio ei ole siis ainoastaan kykenemätön hallitsemaan Delhin ilmansaasteita, vaan sillä on ollut myös osansa ongelman edesauttamisessa.

Tämä Delhin ilmansaasteiden tapaustutkimus antaa arvokasta tietoa niistä ristiriidoista, joita modernit valtiot kohtaavat, kun ne pyrkivät saavuttamaan tasapainon kahden vastakkaisen vastuun välillä: talouskasvulle parhaiden edellytyksien luomisen ja kasvun aiheuttamien ympäristövaikutuksien lieventämisen. Tämä on myös esimerkki nykyaikaisesta ympäristöpolitiikasta, jossa ympäristötoiminta nähdään perusteltuna, mutta ongelmia, joihin toimien tulisi kohdistua, käsitteellistetään ja arvioidaan ristiriitaisesti. Seurauksena ympäristötoimet eivät puutu ympäristöongelmien perimmäisiin syihin. Valtion ympäristöpolitiikan luontaiset ristiriidat korostavat tarvetta keskittyä enemmän paitsi itse valtion politiikkaan myös näiden poliittisten päätösten takana oleviin perusteluihin ja niihin sitoutumiseen. Intian demokratiassa syntyy osittainen ratkaisu, koska kansalaisille löytyy väyliä painostaa valtiota mielekkäämpiin lieventämistoimiin. Tätä auttaisi entisestään avoin ja reaaliaikainen seuranta saastetasoista, jonka avulla paikalliset eivät ainoastaan pystyisi osoittamaan paikallisille päättäjille epäpuhtauksia kotialueillaan, muuta myös ymmärtämään paremmin ne terveysriskit, joihin päästöt heidät altistavat.

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ABBREVIATIONS

BJP	National Democratic Alliance
CAQM	Commission for Air Quality Management
CCDC	Centre for Chronic Disease Control
CNG	Compressed Natural Gas
CPCB	Central Pollution Board
CPR	Centre for Policy and Research
CREA	Centre for Research on Energy and Clean Air
CSE	Centre for Science and Environment
EPCA	Environmental Pollution Control Authority
FDG	Flue Gas Desulfurization
GRAP	Graded Response Action Plan
MoEF&CC	Ministry of Environment, Forest, and Climate Change
NCR	National Capital Region
NCT	National Capital Territory

NGT	National Green Tribunal
OCEMS	Online Continuous Emissions/Effluents Monitoring Systems
ORF	Observer Research Foundation
PEDA	Punjab Energy Development Agency
PM	Particulate Matter
PPCB	Punjab Pollution Control Board
PSCST	Punjab State Council for Science and Technology
PUC	Pollution Under Control (Certificate)
SAFAR	System of Air Quality and Weather Forecasting and Research
TERI	The Energy and Resources Institute
UPE	Urban Political Ecology
WHO	World Health Organisation

1 Introduction

Air pollution kills around seven million people every year according the World Health Organization. Moreover, 9 out 10 people regularly breath in air that exceeds the WHO guideline on limits containing high levels of pollutants. The issue is worst in low- to middle-income countries where the exposure to air pollution is the highest. Together with the estimation that by 2050, 68% of the world's population will be living in cities, mostly in the current low- to middle-income countries where the exposure to air pollution is already the highest (UN DESA 2018), underline the urgency for the academic and the international community at large, to properly understand exposure to particulate matter (PM) in developing countries such as India.

While there has been a lot of work on exposure in Western countries, the Global South has been mostly ignored, which accentuates the need to study the latter as the challenges facing the two differ substantially. The sources of emissions of are different: practices like coal burning, and open burning are still more prevalent in the south than west, while the living patterns in the south expose them to air pollution on a grander scale, as they spend less time in controlled air-conditioned environments (Pant et al. 2016: 481). Just like how exposure to PM in developing countries differs from developed states, the political, economic, as well as social factors and realities that affect and surround environmental decision-making around the issue of air pollution are different. Poverty, political representation- or the lack thereof - certain dominating development narratives, corruption, and a lack of knowledge, all affect the abatement efforts. The more we excavate these processes behind environmental governance, the more we can understand about the blight of these polluted megacities.

Although Delhi has been an Air Pollution Control Area since 1987, it remains one of the most polluted areas in the world (DPCC 2021). For Antonio Ioris (2014), states ineptitude to solve environmental issues stems from the ontological dilemma it finds itself trapped in: the state must mitigate the economy's incessant need for

accumulation in a way that does not flare up class tensions nor absolutely destroy the environment, while at the same time accommodating more accumulation. The environmental action of the state is undermined by its own productivist and privatist priorities. This leads to environmental action that is ineffective, temporary, provisional, and partial. Action that is rational within its framing, but irrational in relation to the economic activities in the background. And so, the contestation and continuity of environmental issues are largely located within the shackles of the capitalist state.

The aim of this thesis is to study the rationalisation of state´s environmental policy against the backdrop of the inherent character of the state, through examining the case of Delhi regarding its air pollution and the related mitigation efforts and environmental policy.

This thesis aims to analyse Ioris' claims about the political ecology of the state through examining state environmental policies surrounding the issue of air pollution in Delhi, and the Delhi region at large (Delhi-NCR). The focus is on the policies surrounding the main four sources of air pollution emissions within and around the city: traffic, crop burning, dust, and industries (Sharma et al. 2018: E13). The policies are evaluated in respect to their effectiveness and impacts, as well as against the forementioned argument put forward by Ioris. This thesis will aim to answer two questions: does the quality and nature of Delhi´s environmental action correspond with political ecology of state (as per Antonio Ioris)? And more generally, to what extent do capitalist states further or even create environmental issues due to the contradictory positions they hold in regard economic growth and environmental protection?

While Delhi has taken great strides in regulating the cars on its streets, by enacting ambitious emissions standards and requiring emissions certificates from every car that uses its roads, the fact that the number of registered cars has continued to exponentially grow and traffic emissions keep dominating the pollution rankings year after year, has driven Delhi to implement increasingly ad hoc policies to curb the pollution levels when they are at their worst, from limiting the number of cars on the streets by license plate numbers, to a public education campaign by the polluted

crossroads (Chowdhury et al 2017, Sharma et al. 2018, Statista 2021, Delhi Government 2018, Roy 2021).

The same pattern is apparent with dust pollution, the failure to regulate construction activities has forced Delhi to ban all construction activities three years running during the worst pollution levels at late October and November. As for industries, 12 thermal plants have been allowed to neglect regulation for years with massive environmental and health consequences for Delhi and its citizens. The self-monitoring that has failed in both previous cases has also been ineffective in mitigating the environmental effects of polluting industrial units. To Delhi's credit, their new real-time and open monitoring system of industrial units is very promising and can offer great opportunities for environmental action for both citizens as well as local environmental organisations. They have also been shifting the industrial units to use less polluting CNG as an energy source (CPR 2018, Dahiya and Myllyvirta 2021, Lavakare 2021, Narain et al. 2020:26-27).

The forementioned environmental action has exemplified the kind of environmental statehood Ioris (2024) discussed in his book, how economic priorities like cheap energy or industrial production take precedence over the environment. Consequently, the state is forced to use increasingly drastic emergency measures when the pollutions levels are at their worst, from closing schools and businesses, like construction and brick kilns, to arbitrarily constricting the number of vehicles on the roads while banning heavy vehicles all together.

Yet none of the measures demonstrate the kind of irrationality and contradiction a capitalist state has involve itself with than the practice of crop burning. When unsustainable farming of rice in the neighbouring states of Delhi, Punjab, and Haryana, had finally almost dried up the groundwater reserves, both states enacted subsoil acts in 2009 to arbitrarily change the time of planting and sowing to alleviate the stress farming was having on the local environment. While the laws successfully halted the desertification of Punjab and Haryana, an unaccounted effect was the practice of crop burning. The subsoil acts shortened the time farmers had to clear their fields of the foot-long rice stalks before planting the next crop of the rotation, wheat. This has led

to the wide use of crop burning as it is the cheapest, fastest, and easiest way to clear the fields on time (Jain 2019).

The state solutions have been colourful: from fines and education, to highly technical programs to repurpose the rice stalks left on the fields (Kumar et al. 2014). While there have been some sustained efforts to diversify the crops, none of the solutions have properly addressed the main issue, the unsustainable farming of rice itself. The policies have been highly rationalised, while being disjointed from the root cause of the issue. On top of this, some other actions, like India's state procurement policies, have actively contradicted the state efforts to curb crop burning. The Indian state buys over 75% of all wheat and rice grown in Punjab and Haryana, effectively sustaining the same practice – rice farming - it has tried to stop (BBC 2021).

The outcome has been a total failure to diversify the crops, and so the fields continue to burn. The burning season coincidentally is the culmination of Delhi's ad hoc air pollution mitigation policies, not only reflecting the integral part the state can have in the creation and continuation of environmental issues, but also the nature of environmental action by the state (Arora 2020, ET 2020, PTI 2018).

2 Theoretical Framework

This dissertation will not only use theories of political ecology a roadmap to answer the research question, but also as a tool to properly frame the focus of the research itself.

The theory section will first introduce political ecology through three commonalities the works of this discipline share according to Robbins (2011). Next, the paper will explore Urban political ecology (UPE), through introducing its ontological orientation towards the society and nature as well as its Marxist historical materialism foundation. Third, the main arguments concerning the political ecology of the state by Antonio Ioris (2014) will be presented by first going through a general theory of state interventions by Scott and then by transitioning from classic Marxist takes on the state to the Marxist school of "capital logic", finally ending at Ioris´ theory of the state.

The author will justify the topic of research through discussing political ecology of urban air, how aerial environments within and above urban landscapes are manufactured through human activities around and in the city: the transit system; power generation; building et cetera. And how neglected this part of political ecology is in relation to other areas of interest, reflecting a wider trend within political ecology where more focus is placed on ''natural resources for consumption, production, and recreation, rather than on environmental pollution'' itself (Véron 2006, Graham 2015:194).

Finally, the thesis will link the case study to the wider discourse of contemporary green economics; define what is an environmental policy; and discuss air pollution as an environmental issue. Introducing the research plan in the following section of the thesis.

2.1 Political Ecology

Political ecology embodies a wide range of definitions. While the focus of contrasting instances of political ecology range from political economy, to formal political institutions, and from discourse analysis to ontological investigations, some common themes still endure. First would be its role as an explicit alternative to 'apolitical' ecology, like the Modernisation Theory or any Malthusian style of analysis about population growth (Robbins 2011:14-16).

Second, it operates through a shared collection of assumptions: the advantages and expenses of environmental change are not distributed evenly among the involved actors and stakeholders, this in turn either mitigates or exacerbates the current inequalities, which in turn leads to political ramifications through transformed power relations between the actors (Robbins 2011:20).

Lastly, according to Robbins (2011) "political ecologists follow a mode of explanation that evaluates the influence of variables acting at a number of scales, each nested within another, with local decisions influenced by regional polices, which are in turn directed by global politics and economics". Political ecology's levels of interest start from the individual, local level, where decisions are made to burn wood and other

materials for warmth, to the national where regulation related to air polluting activities such as coal burning or building are being stripped down, to the international, where international lenders invest heavily in urban expansion within Indian cities (Sinha 2021). These explanations are commonly highly integrative and can be described as 'interdisciplinary transgressions', meaning the explanations integrate several different disciplines ranging from political science to sociology and from development studies to geography. This has resulted in a global congregation of wildly ranging practitioners who advance specific kinds of arguments through their respective points of departure (Robbins 2011:20).

To sum, political ecology should be understood as an approach addressing the constitution and change of social as well as environmental systems, with an explicit orientation towards power, its distribution and relation, between all the actors. The ethical underpinning that surfaces through the political ecology literature has to do with improving the ways social and environmental change is dealt with, aiming towards a world where coercion and exploitation make way for sustainability and equal participation. Unlike with the apolitical theories, the focus of the research is upstream, looking for causes over symptoms whether it's starvation, deforestation, erosion, or just singular cases of exploitation where some actors exploit others and the environment for their own gain (Forsyth 2003).

And so, political ecology is not just environmental politics, instead, it also seeks to critically analyse the political and economic factors that mould the competing definitions and reasonings of any given environmental reality. Increasing public discourse over contemporary environmental predispositions can pave way for the emergence of alternative approaches and solutions that are based on a different, more inclusive, and representative reality (Forsyth 2003, Robbins 2011: 20).

2.1.1 Urban Political Ecology

The conceptual approach that best serves this thesis is urban political ecology (UPE) because it notably offers insight on how manmade natures, such as the air we breathe, come into being, but also importantly observes how intertwined these

natures are with our urban environments. Cities are not at the other end of the scale to nature, rather, in urban environments, they are the same.

UPE posits that the material realities that make up the urban environment are regulated and shaped by the preferences of the elite, leaving the costs to marginalised populations. This reflects the fact that poor urban neighbourhoods are often located in areas that are also characterised by high aggregation of environmental hazards, whether talking about absence of green areas, ground or air pollution, dangerous chemicals, et cetera. This spatial distribution of environmental goods and bads reflects the distribution of wealth and income in that given society (Swyngedouw and Kaika 2014: 469). These material realities do not come about from nothing, they are also partly socially, economically, and politically constructed into the being that is the 'urban' or the 'nature'. UPE calls for the 'excavation' of these processes that bring into existence these highly uneven urban environments. How seemingly 'natural' metabolisms and transformations become appropriated by political, economic, discursive, and social processes, producing environments that mirror and reflect the positions of power and hierarchy (Swyngedouw and Heynen 2004: 902).

UPE is built upon Marxist historical materialism, in other words, it assumes that all beings need to alter their surroundings and through this transformation, nature as well as humans are changed. Marx´s materialism has often been said to reflect a world view of positivist domination over the environment, unconcerned with ecological values, but according to John Bellamy Foster (2000), this notion is nothing but a failure to recognise the intrinsic nature of the interaction between humans and their surroundings. These "evolving material interrelations" or "metabolic relations" - as Marx puts it – should take the forefront of ecological questions and challenges, instead of reducing the issue into a conversation of values. The dichotomy of society and nature, as well as the dualism of anthropocentrism versus ecocentrism, do little to nothing for us in understanding the continuously changing material circumstances of our own existence within our environment. Instead of seeing the economy taking preponderance over the environment, they should be seen as they are, coevolving and interrelated (Foster 2000: 9-12).

Under a capitalist system, the production of use-values functions through specific and relational social, economic, and political positions of power, control, ownership, and appropriation, where nature and labour are mobilised to produce commodities (metabolised sosionatures) in order to attain the exchange value that is inherent in the commodity. The environment is transformed through the mobilisation of labour and nature in this process of capitalist accumulation. The nature becomes more and more implicated in the process of accumulation by which it is transformed, water under the ground, or the animals in the forests, turn into countable, useable, ownable and tradable commodities. (Swyngedouw and Kaika 2014: 470, Swyngedouw and Heynen 2004: 905).

To conclude, if we are to understand any environmental change, we must inspect it in the light of the enduring economic, social, and political relationships. The focus remains in the socioeconomic processes, the mobilisation of discourses and common understandings, that generate injustices, not the natural end products that come into being through these uneven processes. The intricate links between discourse, tecnomanagerial approaches, and socioecological inequalities should be opened: what type 'nature' is being talked about, and what kind of environments and urban landscapes are being promoted? Who is the one doing the promotion and why? And who are the people left out of this discussion? (Swyngedouw and Kaika 2014: 477).

2.1.2 Political Ecology of the State

The state is one of the most, if not the most, important actor in relation to environmental change. Yet still, while concepts such as sustainable development and ecological modernisation have been theorised through and out, the internal forces and the ensuing political processes that guide states environmental policy have been at least partially neglected. A lion's share of the literature on state environmentalism has focused solely on the formulation and implementation of state environmental policy, mostly ignoring the ontological changes within the state that affect its environmental action as well (Ioris 2014: 1-5).

As state is the main actor in creating, implementing, and overseeing environmental policy, to understand the failure, or success, of environmental action, one must understand state's part in the whole process.

In *seeing like a state* James Scott (1999) studies the large-scale attempts of authoritarian governments to reform social and agricultural environments and claims that due to the simplification and standardisation of the complex local contexts, state interventions are doomed to fail. Scott argues that four different components constitute the elements of the most tragically failed state engineering: first is the simplification and aggregation of the facts. Complex scenarios are reduced into simplified and standardised, static data. Second, a hubris vis-à-vis scientific and technological progress, mastery of nature and above everything, the rationalisation of social and natural order according to this image of superior scientific understanding. Scott calls this the "high-modernist ideology". When the populations or the environments do not meet the measurements of the state, there is a motivation for the state to alter the conditions of the population, or the environment, to fit the desired standards. The builders first draw the maps, and then try to fit everything in them. Territories turn to places as people are made subjects. The third element is an authoritarian state that is willing and able to use its full force to realise its plans, and lastly, the fourth element is a civil society that is unable to resist these plans (Scott 1999: 4-8).

Even though Scott´s four elements can offer great insight into failed state interventions, in the case of Delhi they are not sufficient in explaining the environmental actions surrounding the issue of air pollution. First, India is a democratic republic, with democratic governments going all the way from local to federal level. Second, the civil society is not repressed to the level the populations are in the cases in Scott´s book: the Indian constitution guarantees civil liberties and freedoms for all of India´s citizens, and according to the Freedom House´s Freedom in the World -report, India was a "partially free democracy" in 2021 - sliding from 71 points and a "free democracy" status to 67 points out of 100 and a "partly free" status - mostly due to the rising violence and discrimination against Muslims in the country (Freedom House 2021). On the other hand, Scott´s observation of the rationalisation and the subsequent reformulation of society and nature is highly relevant in Delhi´s case, yet some

questions remain: for what purpose is the society and nature being reformulated? Why? And for whom? And most importantly, how does the pertaining economic system affect the state and its environmental policy both as the source of environmental degradation as well the engine of accumulation? The answer could be found from classic Marxist literature, the origin of the material historical approach of forementioned UPE.

While Classic Marxist texts have touched upon the state with varying degrees, there is no coherent, extensive, and sustained analysis of the state. Marx initially saw the modern state as a parasite, a manifestation of the inflexible conflicts of interests found within the society run by officials with only sectional interests within their agenda, the opposite of a genuine and united democratic government that worked for the people. Just how the corporate organisation is there to defend the capitalist´s material interests, the state is transformed into a real estate of officials in their competition for their own advancement (Jessop 1977: 354, Marx 1970: 44-50). Marx additionally wrote of the state as a mere epiphenomenon, a secondary product, of the present system of ownership and the subsequent class conflicts (Jessop 1977: 355).

Another popular approach is to theorise the state as the society´s glue of cohesion. Engels argues that the state emerges concurrently with capitalist economic system, mitigating its antagonistic ramifications to class relations through repression and concessions, moderating the class conflict without threatening the domination of the capitalist class and the reproduction capitalist mode of production (Engels 2000: 206-209, Jessop 1977: 355). In Marxist-Leninist writings the state is commonly a tool of class rule, control of which the respective classes fight over (Jessop 1977: 356). State has also been imagined through its institutions without making assumption about its class character: the state is a public power that evolves during the division of labour emerging with a specific system of governance that is monopolised by state officials specialising in administration and repression (Engels 2000, Jessop 1977: 356).

Lastly, and most relevant to this thesis, are the Marxist classics that have approached the state as a “system of political domination” with distinct effects on class conflict. The question shifts from who is controlling the state, to inspecting the forms of

political representation and state intervention. The state is seen as adequate in securing the long-term needs of the capital as exemplified by Lenin´s remark on democratic republics of his time: “democratic republic is the best possible shell for capitalism” and once it has moved in, no change in personnel, political parties, nor in institutions could waver its dominant position, and so the focus moves from ownership to the quality and nature of domination and its effects (Lenin 1999: 10, Jessop 1977: 356-357).

Along these ideas, the Marxist school of “capital logic” evolved around the Free University of Berlin. The school derives the form of capitalist state and its interventions from the capitalist mode of production and the conditions that necessitate its survival. The state is not capitalistic, it is its own political institution analogous to the needs of the capital. The state establishes arrangements that enable accumulation, from the monetary systems that facilitate the exchange of commodities to legal frameworks that protect private property. The state produces things that the capital needs but cannot provide for itself like the reproduction of wage labour through education, welfare, work legislation and so on. (Jessop 1977: 361-364). As Elmar Altvater (1972) puts it: “The state guarantees the existence of the class of wage laborers as the object of exploitation, creates the general conditions for production including legal relations. Capital itself, by contrast is not able to produce these foundations” (Altvater 1972). **The state acts as the ideal collective capitalist**. This sort of fixation on the internal logic of accumulation as the engine and driver of state interventions is coincidentally one of the driving forces behind the arguments of Antonio Ioris (2014) on the political ecology of the state, the main theoretical framework for this thesis.

Antonio Ioris (2014) argues that three main notable trends emerge when critically examining the rationality, purpose, and reasoning behind state interventions, and how the production of the environmental state has impacted the discourse on, and legitimacy of, the state itself. To begin, the genesis of committed environmental policy and regulation through the state apparatus, particularly since 70’s, was in one hand an answer to an ever-increasing pressure from the civil society and respective groups directly suffering from environmental degradation, on the other hand, it was

a response to the rising tensions between different capitalists due to the increasing costs of production as a result of ecological turmoil and man-made scarcities whether discussing water, land, or any products that rely on biodiversity (e.g. honey). Yet even with the expanding resources of state agencies, and their environmental policies, domestic environmental action is still largely being instigated by foreign multilateral organisations, such as the EU and UN, and is lacking any real leverage against larger economic forces, whether it is in relation energy production or public transportation to demonstrate. All the mentioned issues are compounded by the frequency of incompetency and inconsistency within state environmental policy, effectively downgrading national environmental agencies into a role of secondary importance, especially over long-term collective issues, such as employment, economic growth and so on (Ioris 2014: 10).

Secondly, the main driver of the state in terms of its environmental interventions has to do with mitigating socioeconomic conflicts from spilling into a class-based dispute. The purpose of environmental policy starts and ends with safeguarding the existing private property and production relations. Environmental policy and legislation serve to systemise the entry to, and control of, the parts of nature that have any economic or political significance, or to curtail costs and uncertainties related to production. Environmental policy is filling the anti-commons precondition of capitalist production, ensuring that 'shared' resources do not become overcrowded and thus mismanaged and underused through the management and selective preservation of these said commons. For Ioris (2014), this is the true tragedy of commons. Therefore, environmental protection does not differ much from state-led management of economic volatilities or shortcomings, as its internal logic is practically the same: capitalism's incessant thrive for accumulation must be curbed, but in a way that allows for even wider accumulation possibilities. An "abolition of the capitalist mode of production within the capitalist mode of production itself" (Ioris 2014:10).

Last, environmental statehood is in a constant state of reformulation and a constant object of subversion due to the inherent limitations of the state and the particular features of environmental issues – uneven distribution in space, fluctuation in time and scale, and saturation with ambiguity and urgency. In other words, causes for

state failures in environmental interventions are often twofold: they originate not only from the state's political commitment to other issues, such as accumulation, but also from states own ineptitude to successfully coordinate its own interventions. Given the global and complex nature of environmental challenges, the traditional Westphalian state is in a trouble. The state is not only attempting to respond to the pressure set by its own domestic capitalist class, but also to stakeholders in other countries, as well as oppositional groups in those same places (Ioris 2014. 10-11).

State is an intrinsic part of the socionature whilst it simultaneously acts as the meditator and regulator of its processes. For Ioris, society, state and rest of nature constitute a trialectic – they are interconnected yet form their own separate relational sides of the same disputed reality. The socionatural conditions shape the space of states administrative possibilities, while the state shapes the socionatural conditions themselves. Thus, state is not solely the result of the interaction between society and nature, but also an arena of action that actively reforms and structures society and nature. State is the mediator and enforcer of the society's demands, which it levels to correspond with the balance of power and socioecological realities within that said socionature. This trialectic ontology of the environmental state sheds light on the root causes of environmental problems themselves, as the state apparatus both consolidates society's grip over nature, while simultaneously attempting to promote social cohesion through regulating the degree of environmental degradation. **The action of the state is the focus point of the contradictions, bargaining and contestation: failures in preserving nature or mitigating pollution can be seen as the reflection of asymmetrical balance of power within society and between the society and nature**. Therefore, the continuity, creativity and contestation surrounding environmental problems are primarily situated within the shackles and possibilities of the capitalist state itself: '' The state cannot be understood as merely the controller of settled environmental protection principles, but it is itself a central source of conflicts and compromises '' (Ioris 2014: 24-39).

These three points shed light on contemporary environmental governance and its failure to deliver. Governance is defined as 'the pursuit of more flexible strategies and mechanisms of public administration to accomplish policy goals, realise values

and manage environmental risks and impacts. It includes a range of regulatory processes, incentives and institutional changes aimed at raising awareness, influencing personal and group behaviour, and involving social actors in decision making.' (Ioris 2014:11). The difference between state's environmental governance over any conventional environment management (projects and other ad hoc activities for meeting specific targets) is seen through its combined effort on many fronts, regulatory institutions, informal institutions, and organisational structures and their effectiveness. And so, the state doesn't response to socioenvironmental demands and impacts in a vacuum, it is transformed by them and its existence partly depends on them as the control over the management of nature has always been an integral part of producing and consolidating state power (Ioris 2014).

Yet looking at the world today, it is painfully obvious the plethora of different government agencies, policies and procedures that have been assigned to deal with environmental issues have failed in curbing the global trend of environmental degradation. The rationalities of anthropogenic ideologies and the ontological separation of humans from nature have also seeped deeply into environmental action. Unfortunately, this is no accident. While the state is trying to mitigate and resolve environmental issues, it is at the same time embracing a system that is primarily responsible for these issues. The prerequisite of any state-fix is that it aligns itself with the intrinsic parts of the capitalism's machine of accumulation, whether its mass consumption, resource extraction, or mass waste to illustrate. Unsurprisingly, this leads to state action that is ineffective, temporary, and provisional (Ioris 2014: 166-179).

2.1.3 Political Ecology of Urban Air

As a specie, we are not new to manufacturing our own air, but as cities have replaced countryside as the home of most people on earth, the intensity, and the following consequence of this manufacturing process has reached new heights, especially in low- and middle-income countries. In today's world, nine out of ten people regularly breath in air containing toxic levels that exceed the World Health Organisations (WHO) official guideline limits. WHO also estimates that around 4,2 million deaths annually can be accounted to ambient air pollution through stroke, heart disease,

lung cancer and acute as well as chronic respiratory diseases, while 3,8 million premature deaths occur due to pollution inside the household (WHO 2021). When WHO analysed secondary deaths due to the effects of air pollution, one in eight deaths globally had been affected by toxic air inside or outside the household (Kuehn 2014).

There is a great gap between the severity of this apparent global health crisis and the analytical disregard for urban air (Graham 2015). The politics behind lethal air in cities have remained largely unventured, aside for some critical analyses that the thesis will take a closer look at before the analysis section (see Véron 2006 and Baviskar 2003). Yet as long as there have been cities, there has been deadly air pollution. The historic examples include the great smog of London in 1952 when an estimated 12,000 people choked to death when an anticyclone caused chilled air to stagnate over London, piling up sulphur and carbon dioxide, and other smoke particles, creating a toxic dome that surrounded London for five days (Excell 2015). Urban air pollution is likewise a particularly representative example of the highly entrenched position capitalist accumulation has in today's world, as even ontological rights like breathing make way for its insatiable need to grow (Graham 2015).

Middle and upper classes can live a life free pollution by working in offices, shopping in malls, living in penthouses, and driving in cars that all have filtered air. These air-conditioned cars and spaces simultaneously dumb their heat, noise, and carcinogens straight onto the streets and lungs of marginal communities that do not have the same access to day-around management of air quality. Coincidentally people living by the roads, intersections and highways have a dramatically higher death rate through asthma and other diseases related to pollution (Buzzelli 2008, Huynh et al. 2010, Véron 2006).

The enduring socioeconomic patterns replicate themselves in the impacts of the coproduced urban air, thus the kind of data used should reflect this. The background monitoring that is used to calculate ambient air pollution is often unsuccessful in capturing human exposure to the said pollution, whether in traffic or at home, which is why measuring pollution at the neighbourhood level is important for knowing the exact level of exposure as well as the ramifications of it to health. (Buzzelli 2008: 504).

2.1.4 Green Growth and Nature/Society Dualism

The case of Delhi also ties to the wider conversation of mitigating human impact on our planet and nature through reforming our economic systems, the discourse on "green economies" and "sustainable economic growth". As a theory, green growth claims that continued economic growth – as measured in GDP – can be sustainable with our planet´s ecology. The theory is promoted by all the leading multilateral organisations, from OECD to the World Bank, and manifests in the creation of so called "new green economies", such as the Green New Deal proposals in the U.S or the European Green Deal of the EU (European Commission 2021, Friedman 2019, Hickel and Kallis 2019).

These solutions retain the capital accumulating economic structure by transforming water to wine, unecological economic competition turns to (ecological) sustainable growth. New economic order is created, and our planet is saved, through competition in green innovations and solutions. The same process of accumulation that produces the environmental crises in the first place is now at the forefront of the remedy: increased national and corporate competition for technology and markets is not the issue, it is the solution. Environmental degradation is claimed to be decoupled from economic growth, providing a "magic bullet" to the global ecological crises, whether talking about global warming or mass extinction (Spash 2020: 7-8, 11).

The negative ecological impacts of the economic system are reframed as "local externalities" and even the most daunting global environmental challenges are seen as something technology will solve in the future, while in reality there is no assurance that these technologies will even ever exist. Pollutants are treated as minor peculiarities in an otherwise perfect system, "correctible market failures "that are unique policy problems, not features of the system itself. Consequently, the ensuing policy proposals are implicitly located within the existing system, permissive, and historically irresponsible. This sort of system confirmative, and candidly utopian, thinking ultimately leads to environmental governance that is characterised by both complacency and apathy (Gills and Morgan 2020, Spash 2020: 14).

The inherent issue with these “new economies”, whether talking about sustainable growth, New Green Deal, or the European Green deal, is that they do not address the scale and intensity of the process of accumulation: the energy and material output of the system, the social impacts of accelerating mode of living and new technologies. Basic laws of thermodynamics and conversation of matter are duly forgotten or ignored: energy and matter that goes into the economic system transforms, or degrades, and then returns to the environment in an equivalent mass. The main concern remains with economic growth, not the environment. (Spash 2020: 14, 17). And so, market solutions take priority over comprehensive state interventions, impactful regulation, and planning, as well as efforts to halt or even reverse the material expansion (Gills and Morgan 2020: 6).

This is no coincidence. The dichotomy of “Nature” and “Society” still dominates modern thinking, reflected by the beforementioned tendency of contemporary economists to overlook the intensity and scale of the accumulation, and their habit of framing environmental issues as externalities of the system. This line of thinking unfortunately ignores an important observation about our nature, economy, and society: capitalism is not an economic system, nor it is a social system, it is a way to organise nature - and the society (Moore 2015: 2). Jason Moore (2015) highlights how capitalism functions both as a process and a project: it is not only a narrow set of economic and social relations; since the 16th century capitalism has been co-produced by human and other activities within the interdependent ecosystems (web of life), unified by the “law of Cheap Nature”.

This “law of Cheap Nature” is the integral logic of the current, massively expansive, and grossly uncompromising, mission to transform the work and energy of our planet and its biosphere into capital. Just how Marx saw large-scale industries turning “blood into capital”, the work/energy of natures are transformed into value. The work/energy of the interdependent ecosystems are harnessed to reduce labour costs: the appropriation of natures and the accumulation of capital are thus closely related in the production of surplus value. In creating the necessary conditions for expanded reproduction and rising surplus value, there is a massive demand for unpaid labour by both people and nature, from childrearing and photosynthesis, to

producing food and extracting cheap natural resources. The rising rates of profit, or exploitation, depend on the yields from appropriating these four "Cheap Natures": labour power, food, energy, and raw materials (Moore 2015: 20-27).

In other words, the rate of surplus value increases as long as the worker produces a "rising mass of value", meaning that their wages raise slower than their productivity (or on the other hand, it is possible to raise surplus value through lowering wages when productivity stalls in place). The more efficiently capital can appropriate and create Cheap Natures, the more effectively it can reduce the de facto costs of labour and increase the rate of profit (Moore 2015: 25-26).

Altogether, capitalism creates nature, as nature makes capitalism, both are co-produced by one another. The history of capitalism since the 16th century is made of historical natures, both being the producers and the production of capitalist development (Moore 2015: 27-30). To attain new Cheap Natures capital is not only impelled to look for new sources of cheap labour, food, energy, and raw materials, but as in this case study, transform our air and atmosphere into a colossal dumping site for chemicals, gases, dust, and other toxic particles (Moore 2015: 37-38).

2.1.5 What is Environmental Policy?

For the intentions of this thesis, a purpose-based separation of environmental policy from other policies will be adopted (versus an institutional approach where labels are based on the respective institutions – e.g., environmental ministry undertaking environmental policy. A purpose-based definition also draws the distinction between the intended effects, and side-effects and spill over effects of other policies. A functional separation would include all policies that have any environmental impact as environmental policies.

And so, environmental policies are the range of activities through which public officials utilise their power in an attempt to steer the society's beliefs, values, action, and organisation into a direction that improves, or mitigates the deterioration of, the condition of the environment (Mickwitz 2006: 9-11).

2.1.6 Air pollution as an Environmental Issue

Environmental issues cover a wide range of different and context-specific cases that can have at least few things in common with each other. Per Mickwitz summarises the key characterises of environmental issues in relation to themselves and in relation to the knowledge surrounding the phenomena.

The challenges stemming the nature of environmental challenges themselves are the complexity of the issues; the long times frames related to these issues; they concern remote areas; and their consequences and causes are unequally distributed. Vis-à-vis knowledge, environmental issues are often formulated as a problem by scientists or other specialists; they are shrouded in massive uncertainties; and involve actors and stakeholders with separate belief systems and conflicting goals. Mickwitz does note, that the common characterises listed here are not significant to all cases, like for air pollution in the case of Delhi remoteness of the area is not relevant to the case at all (Mickwitz 2006: 15).

Air pollution does include the other characteristics: first, the issue is complex as there are multiple sources with varying degrees of impact of air pollution in Delhi, all pertaining to a set of specific realities. Whether it's the traffic of Delhi, the physical expansion of the city through buildings activities, crop burning by the farmers in neighbouring states, the polluting industries within and outside the city, or the geographical location of the city itself. The complexity of the issue lends to uncertainty in the mitigation action itself, which again is reflected in the difficulties in laying accountability or credit, a fact that often manifests itself in Delhi through either finger pointing, or in a rarer case of success, fighting over credit, by the respective competing political parties (Adak 2017, Lakshmi 2019, IANS 2020, India Today 2019).

Long time frames characterise air pollution although some results can be attainable on a short time scale: when the first lockdown measures came into effect in Delhi mid-March in 2020 during the early stages of the Covid-19 pandemic, within few days, the smog had cleared, and the pollution levels improved drastically (Mahato and Pal 2020). Unfortunately, while short-term gains are attainable in combatting air

pollution, they are often not sustainable. For Delhi, it took 97% reduction in traffic, and 91% reduction in trucks and commercial vehicles specifically, which obviously is not tenable for a 20 million megacity for any protracted period. And so, by October in 2020, air pollution had returned to severe levels, and by the beginning of November, the pollution levels had exceeded the year before (The Hindu 2020).

The consequences nor the causes of air pollution are distributed evenly. For air pollution in developing countries, your socioeconomic standing within the society has a great impact on how many particles you are going inhale within a day. Studies have been able to link exposure to air pollution to certain socioeconomic traits, such as low income since the 70's (Freeman 1972). A study into 347 households around seven monitoring stations in Delhi found that economic standing was the single most significant factor when measuring exposure, and that the exposure depended on the location almost systematically. The unprotected slums that mushroom near the industrial and other polluting units have no means to shelter themselves against the air pollution while the formal housing prices by these polluted places are at the lowest (Kathuria and Khan 2007).

Lastly, the actors involved with the mitigation action differ substantially both ideologically and, in their interests, depending on the level of action and the actor itself. To demonstrate within the context of air pollution, there is the framing, or in this case, downplaying of the issue to avoid accountability: the Indian environmental minister has claimed several times in the past that there is no link between air pollution and shortened life span, a view so untrue that even the WHO had to comment on it (Behl 2019), while the Health Minister has likened air pollution to something the citizens can combat through eating carrots (Thiagarajan 2019). On the other hand, there are the interests of politicians to rail against their opponents: the governing party in the neighbouring states of Haryana and Uttar Pradesh is Bharatiya Janata Party (BJP), while Punjab is controlled by the Congress. And so, the situation often deteriorates into buck passing and finger-pointing, the federal government blaming Delhi's local politicians while the Delhi's government is laying the fault on the farmers of Punjab and Haryuna (Adak 2017, Chanakya 2020, Lakshmi 2019).

3 Research Design

3.1 Theory Testing Policy Analysis

This thesis will inspect the explanations put forward by proponents of urban political ecology surrounding the state and its environmental action, while also uncovering other case specific issues and possibilities that environmental decision-making can have in developing economies like India, through a comprehensive qualitative analysis of Delhi's and NCR´s air pollution mitigation and other related environmental policy.

The aim of this thesis is to study rationalisation of state´s environmental policy against the backdrop of the inherent character of the state, through examining the case of Delhi regarding its air pollution and the related mitigation efforts. The research questions are: 1. Does the quality and nature of Delhi´s environmental action correspond with the theories Antonio Ioris regarding the environmental state? 2. To what extent do capitalist states further or even create environmental issues due to the contradictory positions they hold in regard economic growth and environmental protection?

Based on Marxist urban political ecology, Antonio Ioris, in his book *Political Ecology of the State*, puts forward the argument that states ineptitude to solve environmental crises stem from its contradicting orientation towards the issue: the state must curb the economy's incessant need for accumulation in a way that does not absolutely destroy the environment and/or flare up class tensions, but also in a way that accommodates even more accumulation, and so '' the complicated procedures laid down by state agencies are undermined by the productivist and privatist priorities of the same state (i.e. its anti-commons obligations)'' (Ioris 2014: 28).

Ioris concludes that ''environmental statehood's main purpose has been to soften and, ultimately, justify exploitative processes that depend, directly or indirectly, on the appropriation of socionature for private economic gains'' (Ioris 2014: 31). This constrains states environmental action into temporary quick fixes that only address the most severe cases. These 'state-fixes'' include a wide range of mechanisms and

instruments, from regulation and standards to more specific action, all sharing a natural inability to detach themselves from the contradictions that define a capitalist society, thus also being unable to produce long-term answers to the issues they are trying to solve.

From this standpoint, Ioris describes government environmental action as:

a) Ineffective, temporary, provisional, and partial. Only answering to the most urgent issues.

b) Irrational, contradicting, and illogical: rationalisation of the state-fix whilst sustaining irrationality in the assessment and conceptualisation of these problems.

c) The contestation and continuity of the environmental issues, and so the related mitigation action, are largely located within the shackles and possibilities of the capitalist state.

d) All the former points are compounded by the lack of funding, technical info, and staff in environmental action and regulation.

The thesis will attempt to track these four claims through analysing the relevant environmental policy surrounding the four primary sources of air pollution in Delhi: industries, traffic, dust, and crop burning. Other notable sources of emissions are open waste burning and indoor fires, but for the purposes of this thesis- and to keep it at a readable length – the main four sources of air pollution in Delhi will be sufficient, as together they comprise at least 80% of the PM in the air of Delhi at any given time of the year (Sharma and Saraf 2018).

The thesis will discuss regulatory policies covering the registered vehicles of Delhi, from their age to tracking their individual emissions through an emission certificate. The thesis will likewise examine the two hands-on policies the city has used during the last five years when the pollution levels have been at their worst. The odd-even scheme that has been on ice since 2019, and the 2020 campaign to motivate drivers to turn off their engines at traffic lights.

As to crop burning, the thesis will briefly cover some technological solutions the state actors have come up with over the years before going into depth with the series of government decisions and policies that birthed the contemporary situation in the first place. The 2009 subsoil acts in Punjab and Haryana and the government procurement policies which have both sustained unecological farming in the region and the environmental externalities that have followed.

On top of discussing regulation covering the industrial units within Delhi-NCR, the thesis will deliberate the slow implementation of regulation curbing pollution from the 12 thermal plants within 300km of Delhi. Lastly, the thesis will analyse effectiveness of regulation regarding dust, especially around construction activities, finally looking into the Gradual Response Action plan (GRAP), an air pollution emergency tool that includes multiple actions cascading up accordingly to the severity of air pollution.

The policies will be considered individually, but also in relation one another whenever it is appropriate. Evaluating the policies as an ensemble is necessary to discover whether they are not only rational within their own framing of the issue, but also as a part of the overall mitigation action. The thesis will not for example consider every single regulation by itself, rather investigating the effectiveness of the regulation as a whole.

The analysis will be qualitative and based on a plethora of sources: the issue is multidimensional and so the list of sources should reflect this. This means using environmental and health reports and analyses, different government reports and studies, media reports on pollution and related mitigation action, investigations by non-profit research and environmental organisations as well as policy research organisations and other think tanks. Being able track and understand the environmental impact of policies not only requires the obvious data from environmental studies, but also information about the political and administrative realities surrounding the policies, thus investigations into aspects like enforcement and implementation will mostly rely on reports by the state, environmental organisations, and media reports. Altogether, Delhi's air abatement efforts have failed to curb the air pollution in Delhi, which is

why the focus on effectiveness will be largely on failure, whether the policies lack in extent, enforcement, ambition, funding, framing the issue itself, rationality, or logic.

The main issue and advantage with a multifaceted analysis like this is the fluidity of the research: the sources that are used vary greatly depending on the issues at hand and the availability of the sources themselves. The immediate environmental impacts of air pollution abatement policy are usually difficult assess, unless there some specific environmental studies like in the case of the odd-even schemes or the thermal plants. This is where other kinds of studies or data can offer reprieve, like in the case of regulating the polluting industrial units of Delhi, where a study into regulatory organisations, the state boards, uncovered several issues that feed into the poor supervision. In Delhi, newspapers and different environmental organisations and other entities also frequently report on construction sites and other businesses that flaunt regulation, (e.g., Wire 2020). The advantage turns into a disadvantage when it comes replicating the analysis: the highly context specific analysis will be difficult to copy, and the evidence will be in many scenarios impossible to obtain. This the reason the analysis framework should be considered more like a loose road map to the destination, instead of a rigid guideline of how to do the study.

The categories of analysis are based on the arguments put forward by Ioris (2014) as well as on conventional social policy analysis (Jimenez et al. 2014). After presenting and evaluating the relevant policies, and offering policy recommendations, the thesis will discuss the findings more in depth and how well they correlate with political ecology's eco-Marxist theory. The categories of analysis will be discussed whenever there is data available. Policy analysis made the most sense as the methodology as it built to investigate policy, the exact aim of this thesis. It offers a clear map through which to examine the policies while simultaneously making the analysis more systematic.

More specifically, policy analysis offers a path to understand how and why governments create and implement certain policies. The policy analysis in this thesis will be focused on outcomes, interactions as well as representations. The environmental outcomes of a policy can be showed through quantitative studies into the air quality of Delhi, as well as more specific studies of air quality during the implementation

respective policies. Interactions refer to the values at stake, what actions or activities are given priority over others; what harmful economic activities are allowed; and which mitigation actions are neglected? And lastly, representation, how is the problem defined and tackled; under what assumptions is the framing of the issue based on; how is the problem rationalised (Browne et al. 2018)?

Lack of data is always an issue when investigating policy impacts within a context of a developing economy, especially in a country like India where monitoring of air pollution is still severely lacking (Free Press Journal 2020). But as mentioned before, while there might not always be environmental studies available to assess the immediate effects of a policy, they are often other sources or news on its implementation, effectiveness and what not, that can be used to illuminate its impacts at least partly.

3.2 Material

Fortunately, English is the second most spoken language in India, which is why there are plenty of English newspapers that report regularly on new regulation, related violations and on their perpetrators, new environmental degrees, and laws, on the quality of air itself, and on the different sources of air pollution. The downside of English newspapers is the fact that they are mostly consumed by the English-speaking middle-classes of India, which is reflected in the content. When considering earlier studies on middle-class bias within Delhi's environmental policy, it is of utmost importance to survey the information properly when using news sources (Baviskar 2011, Véron 2006).

The second valuable source of info are the different research institutions and think tanks that have studied and analysed air pollution in India, and especially in Delhi, extensively. Special mentions belong to The Energy and Resources Institute (TERI) in Delhi, that has done comprehensive reports on the makeup of the air of Delhi, which has helped to guide my thesis greatly. Two great think tanks that have written broadly about environmental policy in Delhi, and India at large, are the Centre for Policy Research (CPR) and the Observer research Foundation (ORF).

Third source of data and the main source of primary data for the thesis are the government and court actions, reports, actions-plans, and other papers on air pollution control. The most important state actors in India vis-a-vis air pollution have been the Ministry of Environment, Forest, and Climate Change (MoEF&CC), the Central Pollution Control Board (CPCB) under the environmental ministry, who oversees all the respective state pollution control boards that are ultimately responsible for the prevention, control and abatement of air pollution, and its subsidiaries on state level. In October 2020, the powers of CPCB were transferred to the Commission for Air Quality Management (CAQM) in the National Capital Region and the adjoining regions.

Lastly, this thesis will utilize several different academic environmental and health studies on the pollution of Delhi and of air pollution in general. As the issue of air pollution is so complicated, having several sources of emission that are all veiled in different webs of power with their specific issues and contestations, it is of utmost importance to triangulate the data as well as possible. This means using data and studies on exposure to air pollution, on the pollution levels themselves, as well as on air pollutions impact on health.

Before ensuing with the research, the thesis will introduce the reader to the context surrounding the present-day situation. First, by explaining what air pollution is, what are its possible consequences to health, and what are the universal health guidelines regarding it. Then the thesis will attempt to justify the topic and focus of the research through first discussing air pollution as a growing trend in the developing world, and then by introducing the four primary sources emission and their individual stakes on the overall air pollution levels in Delhi. Finally, ahead going into the analysis, the thesis will introduce the earlier academic works on environmental policies of Delhi, and on political ecology of urban air in Delhi, by Baviskar and Véron, who claim that the earlier environmental efforts have been largely a beautification project for the middles-classes of the city. Lastly, a quick rundown of the mitigation policies from their inception till the 2000's will be made to understand the context behind the contemporary decision-making.

3.3 Research Structure

A priori assessment:

Defining the problem assessed by the policy.

- Policies divided into four categories based on the source of air pollution they are attempting to address: traffic, industries, building, or crop burning

Assessing policy objectives and its target populations.

- Objective's reactionary and fragmentary vs. proactive and comprehensive.
- Based on accurate/inaccurate models of nature or/and human behaviour.
- Increasing rationalisation of the response vs irrationalism of the economic activities in the background.
- Irrationality/rationality in the assessment and conceptualisation of the problem.

A Posteriori evaluation:

Studying effects of the policy.

- Provisional/consistent.
- Effective/ineffective (also intended and unintended outcomes).
- Temporary/long lasting.
- Contradicting and illogical activities vs. addresses root causes, logical, well laid out.
- Tensions, conflict, continuity, and creativity – states part and involvement in the creation, transformation, and continuation of the issue itself.
- Enough funding/staff/tech info available/not available.

Policy implications: distribution of resources, changes in rights and statuses.

- Distribution of exposure to air pollution.
- Distribution of costs.

Overall impact on pollution levels

Alternative policies: surveying existing and possible policy models that could have addressed the problem better or parts of it which could make it effective.

- Recommendations.

(Policy analysis framework: Jimenez et al. 2014).

4 Exposure to Particulate Matter in Delhi

4.1 What is Particulate Matter?

Particulate matter (PM) refers to the mixture of solid particles and liquid droplets suspended in the air. While some particles such as smoke and dust are large enough to be seen by the naked eye, other particles are so small that they can be visually captured only through the lenses of an electronic microscope. Particle pollution is imagined in two categories: PM_{10}: any inhalable particles with a diameter of 10 micrometres or smaller; and $PM_{2.5}$: fine inhalable particles with a diameter of 2.5 micrometres or smaller, thus $PM_{2.5}$ also encompasses particles with a diameter less than 0.1 micrometres (EPA 2021, WHO 2013: 2).

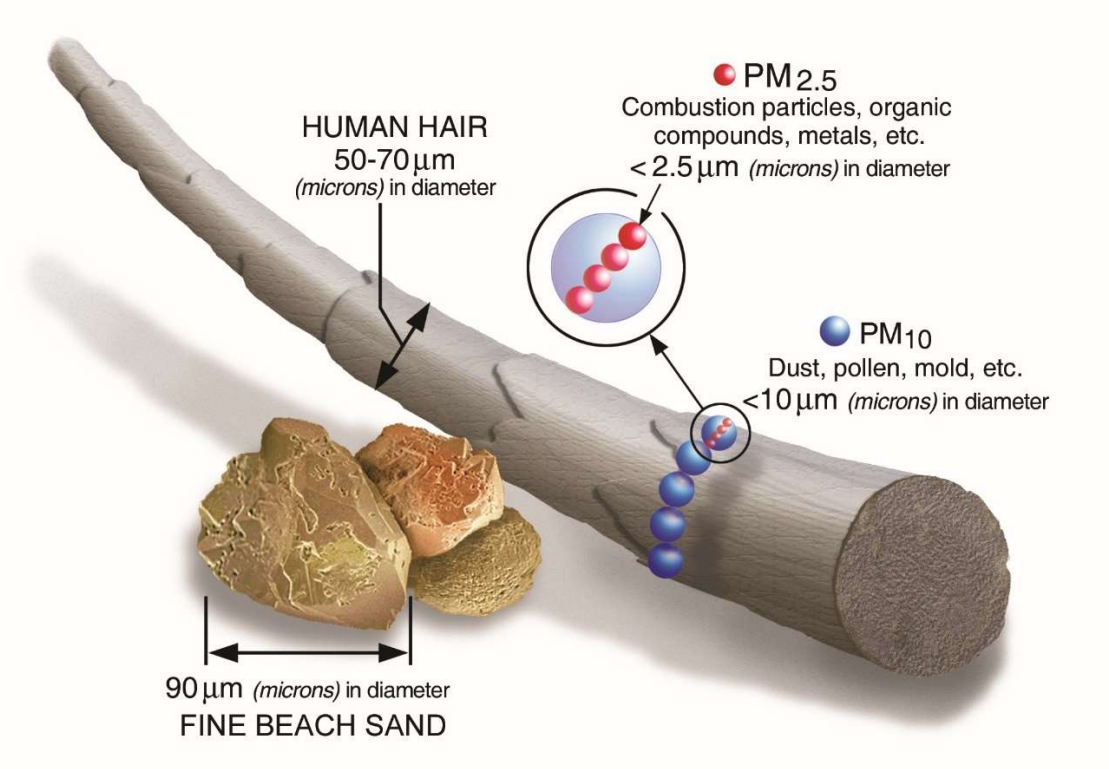

Figure 1 PM Particles compared to an average human hair (EPA 2021)

PM_{10} and $PM_{2.5}$ often have a different origin and so their chemical compositions often differ as well. Much of the $PM_{2.5}$ found in the air is a product from combustion of gasoline, oil, coal, or wood, which additionally makes a significant portion of PM_{10}. PM_{10} also compromises dust from construction, landfills, agricultural burning, wild-fires, dust from erosion, pollen, and industrial waste (CARB 2021).

PM can be either directly discharged from a source, as primary particles, or they can form in the atmosphere through chemical reactions of gases, as secondary particles. PM can be gasses like sulphur dioxide, nitrogen oxides, ammonium; inorganic ions like sodium, potassium, and calcium; organic and elemental carbon; metals; particle-bound water; and other organic combinations. These particles and their combinations can stem from the environment, from trees and other vegetation such as pollen, or they can surface from anthropogenic sources like combustion engines, combustion for energy, industrial enterprises such as building, mining, manufacture of cement, ceramics, and bricks as well as smelting, or erosion of streets through traffic. (CARB 2021, WHO 2013: 2-3). The sources of PM emission for Delhi will be explored further ahead in its own section.

4.1.1 Health Impacts of Particulate Matter

The health effects of these particles can be devastating, both PM_{10} and $PM_{2.5}$ contain inhalable particles so tiny, that they can penetrate the thoracic region, the chest area, of the respiratory system. Exposure to inhalable PM can have both short-term, from couple of hours to days, as well as long term, from months to years, effects on health. These effects contain respiratory and cardiovascular morbidity, like exacerbation of asthma, respiratory symptoms through decreased lung function, and increase in hospital visits, along with increased mortality from cardiovascular and respiratory diseases as well as from lung cancer (Kyung and Jeong 2020, WHO 2013:6).

As far as mortality goes, long-term exposure to $PM_{2.5}$ has been proven to impose a stronger risk factor than the larger (particles between 2.5 and 10 micrometres) parts of PM_{10}. WHO (2013) estimates that all-cause daily mortality (mortality from all causes) rises by 0.2-0.6% per 10 µg/m3 (micrograms per cubic metre of air) of PM_{10} while long-term exposure to $PM_{2.5}$ increases the long-term risk of cardiopulmonary mortality by 6-13% per 10 µg/m3 of $PM_{2.5}$ (WHO 2013).

The one's at most risk are people with existing lung or heart conditions, in addition to elderly and children. Sustained exposure to PM impacts lung development for young people and can inhibit ailments that vary from reversible deficits in lung function to chronically reduced lung growth rate and function. Children are particularly vulnerable because they breathe more rapidly and are closer to the ground (where some pollutants are at their peak) than adults and thus breath in more particulate matter (WHO 2018). The exposure to air pollution is mostly involuntary and all-around pervasive which makes it a critical determinant of health for those who are at risk and exposed (WHO 2013).

Based on the scientific accumulated evidence on the health impacts of air pollution, WHO first produced its air quality guidelines in 1987, updating them in 1997, and finally in 2005. For $PM_{2.5}$ the annual recommended average should not exceed 10 µg/m3 and 25 µg/m3 should not be exceeded more than three days a year (24-hour

mean). For $PM_{10,}$ the yearly average should not exceed 20 µg/m3 and 50 µg/m3 should not be exceed more than three times per year (WHO 2015).

4.1.2 Exposure to Air Pollution in the Developing World Versus the West

While the 2020 lockdown measures decreased the pollution levels in Delhi drastically during the summer, 2019 exemplifies a more typical all-around year in Delhi as far as it comes to air pollution. The annual average of $PM_{2.5}$ in India in 2019 was 58.1 µg/m3, which is almost six times more than the recommended level, also exceeding the 24-mean recommendation level - as a daily average. In Delhi, the respective daily average was 98.6 µg/m3, which is almost ten times the recommended level, and near to two times more than what is recommended not to be exceeded over three times per year (Chatterji 2020).

These drastic, and to be frank, gargantuan levels of pollution further underline the urgency for the academic and international community at large, to properly understand exposure to PM in developing countries such as India. While there has been a lot work on exposure in Western countries, the global south has been partly ignored, which is problematic as the challenges facing the two differ substantially. To begin, there are multiple factors that are unique to developing countries that affect exposure to PM, whether talking about open water burning, open cooking, crop burning et cetera, that merit a more well-defined distinction, as well as sources of emission like solid fuel burning that play a major part in in-door as well as ambient air pollution in the developing world but do not really impact the developed world. Third, people in the developed world spend a lion's share of their lives inside climate controlled and air-conditioned microenvironments, a fact that is less reflective of the everyday living patterns in developing countries. Lastly, because of high poverty levels, the following energy poverty, and lower standards of living, specific parts of the population, people living in slums for example, are more vulnerable to the negative health consequences of PM in developing countries (Pant et al. 2016: 481).

If the current trends of growth in population quantity, and density due urbanisation, continue to dominate the foreseeable future of the developing world, alongside industrialisation, the health impacts of air pollution will continue to soar, which in turn must be acknowledged both in the study of exposure to PM, as well as in the approach to air pollution itself.

4.2 Origins of the Air Pollution in Delhi

The National Capital Territory (NCT) of Delhi is globally recognised as one of the most polluted regions in the world (Chowdhury 2019, Pant et al. 2016), highlighted by the fact that out of the 30 most polluted cities in the world (if measured by the deadlier $PM_{2.5}$), 21 are in India, and nine out of those are in the NCT (IQAir 2020). As mentioned in the previous chapter, Delhi's daily average pollution hovers around 10 times the WHO recommended levels and during the peak months in the winter, the measured pollution levels can reach as high as 700 µg/m3 of $PM_{2.5}$ in some stations, which is 12 times the 24h-mean recommended level (Shrangi and Pillai 2020). Making New Delhi handily the most polluted capital city in the world.

There are five key elements that have had the most impact in the degradation of the air quality of Delhi: the city's geographical location; crop burning in the neighbouring states of Punjab, Haryana, and Rajasthan; emissions from transportation; industrial pollution; and large construction enterprises (Chatterji 2020).

$PM_{2.5}$		
Sectors	Winters	Summers
Residential	10%	8%
Agri. Burning	4%	7%
Industry	30%	22%
Dust (soil, road, and const.)	17%	38%
Transport	28%	17%
Others	11%	8%
PM_{10}		
Sectors	Winters	Summers
Residential	9%	8%
Agri. Burning	4%	7%
Industry	27%	22%
Dust (soil, road, const.)	25%	42%
Transport	24%	15%
Others	10%	7%

Figure 2 Average sectoral contributions of PM2.5 and PM10 in Delhi (Sharma et al. 2018: E13).

4.2.1 Geographical Location

Why is air pollution so devastating in Delhi, while cities like Chennai and Mumbai have all the same ingredients for an air quality disaster? Mumbai is more densely populated than Delhi alongside a traffic just as chaotic, while Chennai is home to the biggest automobile manufacturers of the world, from BMW to Volvo, on top of two petroleum refineries, many other heavy industrial units, and over 7000 small or medium sized manufacturing units. The answer is location. The central criterion for air pollution is the speed and direction of the wind. Winds stemming from the Bay of Bengal repeatedly push a 'reset button' on the pollution elevated above Mumbai and Chennai (Singh 2018). Unfortunately for Delhi and the other cities in the northern plains, there are no natural remedies like this for their plight.

The city of Delhi sits on a landlocked plain that is surrounded by the Himalayas in the north-east, by the Thar desert in the south-west, and by the central plains in the south-east. As winds arrive from the western coast, carrying along any pollutants on their way, the air gets trapped above the plains before the Himalayas. As the air pressure pushes from one side, but cannot pass through the other, the PM brought by

the winds begins to accumulate over and through the northern plains (Singh 2018). In the summer, the high temperatures create an updraft that lifts the toxic smog to be scooped up by the monsoon winds from the Indian Ocean, alleviating the pollution levels drastically. But in the winter, the morning mist captures elevated particles, trapping them at the surface level while the lack of wind and the cold air coming from the mountains create a lid-effect, raising the pollution levels substantially to quantities as high as 300-700 µg/m3 of $PM_{2.5}$ (M.R 2018).

4.2.2 Crop Burning

Location is not the only reason why Delhi can enjoy relatively clear skies during the summer, while being plighted by a thick and dark smog during the winter. The Indian Ministry of Earth Sciences air quality monitor, SAFAR (the central government´s air quality monitoring agency), estimated in the beginning of last November that at its peak, almost 40% of the pollution clouding the city's skies was due to stubble (or crop) burning at that period. According to their data, 3216 farm fires were spotted in the neighbouring states of Punjab, Haryana, Uttar Pradesh, and Uttarakhand during this time. The year before, the percentage of pollution due to crop burning reached as high as 44% according to the agency, and consequently, the pollution levels reached such a level that the city had to declare a public health emergency, banning all construction activities, hot mix plants and stone crushers for five days as well as closing all the schools within the city for a week (Kapil 2019, TOI 2020, SAFAR-India 2018).

It is important to note that due to its seasonal nature, while crop burning does contribute massively to the levels of air pollution during the peak levels of winter in Delhi, the sectoral contribution of crop burning overall throughout winter and summer months hovers at only around 4% in the winter and 7% during the summer.

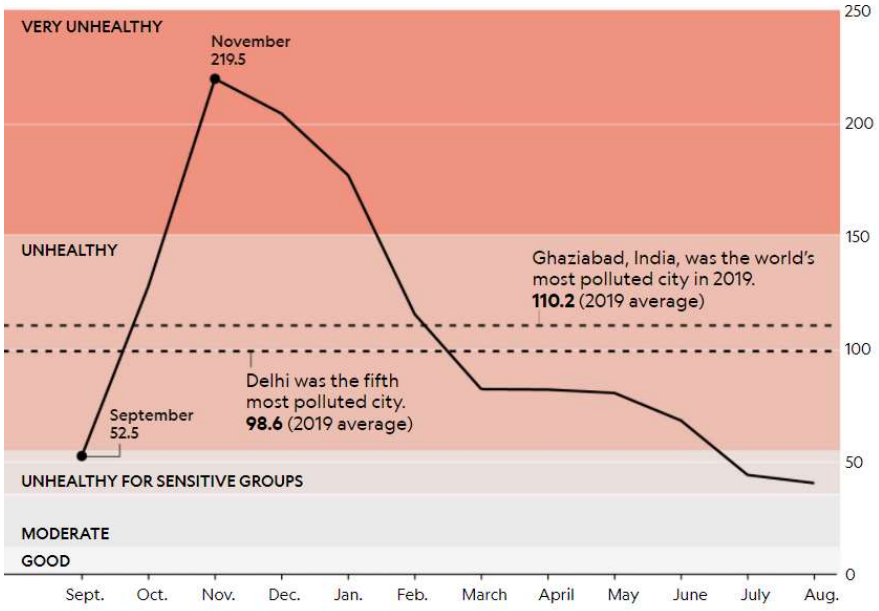

Figure 3 Seasonal PM2.5 air pollution in Delhi, India, 2016-2020 (Ryan Morris 2020).

In India, burning of fields is banned and the law is enforced through fines, court orders and other government surveillance activities. Yet regrettably, the farmers do not have a practical solution to their annual dilemma: how to clear the fields in the short duration between the harvesting of rice and sowing of wheat in the same fields.

4.2.3 Vehicular Emissions

The Automotive Research Association alongside the Energy and Resources Institute prepared an extensive analysis of the sources of $PM_{2.5}$ and PM_{10} in Delhi for the Indian Ministry of Heavy Industries and Public Enterprises using two different modelling approaches (receptor and dispersion), the final report was published in Autumn 2018. According to the report, for $PM_{2.5,}$ 28% of the pollution during the winter is due to the transport sector, while during the summer its share is 17%. As for $PM_{10,}$ the respective numbers are 24% and 15% (Sharma et al. 2018: E12), making vehicular emissions the main singular source of $PM_{2.5}$ in the city. These emissions also make up the bulk of the nitrogen oxides and carbon monoxide in Delhi's air (Bhandarkar 2013:33-40).

Now, there are 11.89 million registered motor vehicles in Delhi, a number that has been steadily rising year after year, going from 3.46 million in 2000, to 6.45million in 2010, to 8,83 million by 2015, to finally where we are now (Statista 2020).

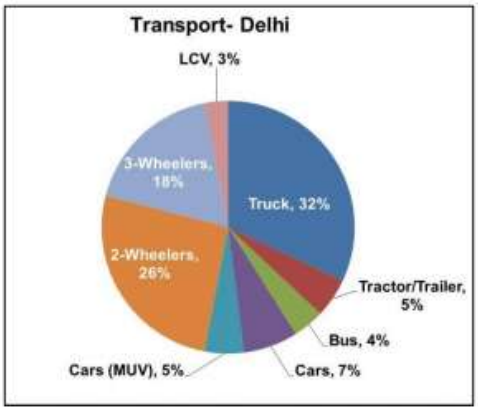

Figure 4 PM2.5 Emissions based on vehicle category (Sharma et al. 2018: 409).

4.2.4 Industrial Pollution

Industrial pollution makes up around 22-28% of Delhi's pollution depending on the time of the year (Sharma et al. 2018: E13).

Delhi is home to the second most polluted industrial cluster in the whole of India according to the Central Pollution Control Board (CPCB), the Najafgarh drain basin, along with several other industrial clusters that have polluted their surrounding soil, water and air in a way that transgresses the local regulatory standards, contributing to the city's poor air and water quality. There were 3,182 different industries in the NCR-region in 2019 and Delhi leads India in having the densest cluster of small-scale industries (Choudhary 2019, Jayshree 2019).

Additionally, there are 12 coal burning thermal power plants within 300km of Delhi. While the plants have been mandated to shift to FDG-systems from 2017 on, not even the monthly fines per unfiltered unit by the CPCB, and two separate, and already passed, deadlines have not been enough to incentivise the plants to fully shift to modern filtration systems. Emissions from these units encompass nitrates, mercury (accounting over 80% of all mercury in Delhi's air) and secondary PM, which are

formed in the atmosphere by the sulphur compound emissions from these units (Gandhlok 2020).

Lastly, the federal government carbon tax is solely levied upon coal, which has turned many major industries, like textile and cement, to power their operations through cheaper alternatives, such as pet coke and furnace oil, which both have a massively higher contribution to global warming than coal, whilst simultaneously being more hazardous to health and the environment. While the use of these cheap alternative fuels remains banned in Delhi since 2017, their ongoing usage in the neighbouring states continue to add to the overall air quality situation in the Indian capital region (Shira et al. 2017).

4.2.5 Dust from Construction Related Activities

The population of NCR has grown from 16.6 million in 2011 to 46.1 million in 2011, with an annual growth rate of over 10%. This massive growth in population has been matched with an equally massive boom in construction activities within the region (Raman and Mukerjee 2019).

Construction and demolition sites can be a source of extensive pollution as the amount of dust these sites are able to generate and disperse into the air is immense. To combat this, the Indian Supreme Court decreed in January of 2020 that all construction sites of 20,000 squares or more are required to install anti-smog guns, watercannons that spray tiny droplets of water in order to bring construction dust back to the ground, onto their premises in an effort to curb construction related pollution (Rajput 2020, Yadav 2020).

The court decision was informed by a study conducted by the Energy and Resources Institute (TERI), claiming that during summers dust stemming from construction related activities contributed around 40% of all PM in the air of Delhi (Mishra 2020). The massive part dust plays in forming the dark smog above the city became more obvious to the citizens of Delhi during the early Covid-lockdowns, when construction activities were banned, alongside local industries and non-essential travelling, and subsequently PM_{10} and $PM_{2.5}$ concentrations in the air were halved compared to the

same time the years before (Mahato et al. 2020). The fact that Delhi's air improved by about 40-50% only four days into the lockdown, further highlights the high impacts of the local sources of emission such as construction, traffic, and local industries. And so, it is no coincidence that construction activities are among the first to be banned whenever Delhi declares a pollution emergency (Arora 2020).

Construction dust is not merely a local issue for Delhi, it is also a regional source of pollution. There are around 360 brick kilns scattered around the outskirts of the capital region, mostly in the Jhajjar, Faridabad and Ghaziabad regions (Chatterji 2020) and around 3,000 kilns in the neighbouring state of Punjab. The kilns are most often powered with coal that releases high amounts of sulphur in the air. A single kiln can pump up to 48,000 kilograms of carbon monoxide into the air during one season of operation (Jordan 2017) and as with many other sources of pollution mentioned before, likewise with kilns, technological upgrades can cut the amount pollution substantially, up to 70% (Chaba 2019).

5 Background: Birth of the Environmental State in Delhi

5.1 Previous Research

Delhi has been an Air Pollution Control Area since 1987, a fact that doesn't reflect too well on the policy measures taken to combat air pollution since then, as the Delhi region remains one of the most polluted areas in the world to this day (DPCC 2021).

Both the planners of the environmental action, as well as the Indian Supreme Court, have both laid the blame on the poor execution of policies, insisting that the policies themselves are good, but that the implementation has been lacking (Sharan 210: 72). On the other hand, political economists like Amita Baviskar and Véron have written on how Delhi environmental policy has been taken over by the middle-class for their own beautification project of Delhi, at the expense of the poor. Turning environmental policy from a common good to an exclusionary practice.

Véron (2006) claims that middle-class bias is inherent in Delhi's air pollution abatement efforts: in the respective government, environmental organisation, and judicial

activism. Véron sees the air pollution policies as a part of a wider context of city beautification. The abatement action does not only answer to the 'needs 'of the capital, but also the interrelated environmental interests, values, and tastes of the middle-class. According to Véron, middle-class bias is evident from Delhi's policies to curb vehicular pollution, while antipoor attitudes are apparent in the city's relocation efforts concerning small scale industries. Véron concludes that the air pollution is not a simply an outcome of a capitalist production system, but also a result of conspicuous consumption, poverty, and lack of effective regulation (Véron 2006).

For Véron, the biased middle-class activism through the judicial system is also a contributing factor to the refinement of the boundary between public and private in framing environmental issues. For him, the air-quality policies represent only part of a larger process of 'city beautification' or 'city purification'. (Véron 2006: 2106-2107).

For Baviskar, the national capital has made the management of urban spaces an anxiety for itself, as Delhi acts as the image of the Indian nation state. Baviskar writes how Delhi's master plan visioned a model city that is clean, prosperous, and orderly, but failed to realise that it would be needed to be built by the working poor for whom no provisions had been made in the plan. The following policies have systematically criminalised vast parts of the city's working class through deeming slums illegal, while keeping practices that make these slums inevitable and necessary. These bourgeoisie environmental policies of displacement are a manifestation of capitalist restructuring and real-estate development. The policies aim to improve the environmental quality of life for the middle-class, through misplacing and marginalising the city's subaltern (Baviskar 2003).

To sum, economic liberalisation empowered the middle classes in India both ideologically and materially which led to bourgeois brand of environmentalism: "the (mainly) middle-class pursuit of order, hygiene and safety, and the ecological conservation, through the public sphere". Mobilising public discourse and citizenship in a way that excludes the poor of the city (Baviskar 2011).

Baviskar and Véron both illustrate the 'world city' fantasy, that drives the beautification process: planners dream of these streamlined modern cities where small

industries and slums are out of sight, ''the ugliness of production'' must be hidden for the environmental capitalist. The city is rebuilt in the image of the middle-class while trying to hide its ugly underbelly of others, the millions of workers, and the urban poor.

While the two authors have written insightfully on the political economy, and ecology, of the past environmental decision-making in Delhi, there is a need to inspect the situation more comprehensively: the focus of the both writers is exclusively within Delhi, while the issue of air pollution is a regional issue in Delhi-NCR, regional sources of emission like crop burning, thermal plants, and other polluting activities within the region all have an impact on Delhi's air.

This thesis will attempt to offer a more holistic analysis of the situation. Theoretically, middle-class bias and 'beautification' are not sufficient to wholly explain the lack of teeth within Delhi's air pollution mitigation strategies, and so there is a need to also inspect the rationalities and commitments behind the local, state, and federal level government policy. While middle-class bias can be evident in some policies, it is as important to analyse the motivations behind them, what issues are prioritised over others, what regulation is enforced and what is not, what kinds of activities are allowed or banned. To uncover these issues, one must zero in on the state as the primary environmental actor.

Before ensuing with the analysis, the reader will be introduced to the birth of environmental statehood in Delhi to set the context for the research: Sharan (2010) writes that two different strategies constituted the contemporary urban landscape in Delhi: one strategy concerning the law, the other risk mitigation.

5.2 Zoning Out the Pollution: The Beginning of Environmental Regulation in Delhi

The history of regulating pollution in Delhi began in 1962 when the first master plan for the city was conceived. The city planners were facing massive chaos and sprawling urban development as India and Pakistan had just partitioned and waves of refugees were flooding into the city, looking to start a new life in Delhi. The chaotic urban

growth was mirrored by the expansion of industries, many businesses had grown exponentially in a period of ten years, leading to overcrowding, and mingling of housing and polluting industrial units. And so, the planners wanted the manufacturing industry out of the commercial and domestic arenas of Delhi (Baviskar 2003, Sharan 2010).

The plan was to zone areas for the industry based on a distinction between polluting and non-polluting industries, and between collaborating and non-collaborating industries. After a survey of the industries in Delhi, it was estimated that around 40% of land under small-scale industries was producing 'nuisance', for medium sized industries the respective number was 52% and for the large-scale one's 63%. Industries that produced apparent nuisance to the neighbourhood, like smoke, fumes, stench, heat et cetera and/or were hazardous in nature, were totally banned from the city. Large and 'rural' industries were also largely located outside of the city's borders (Sharan 2010:74).

Ideas for a variety of different industrial establishments were put forward, like flatted factories, multifloored buildings for small-scale businesses with high intensity labour operating in the commercial areas of Delhi while lesser intensity industries were to be in the peripheral areas of the city. Non-polluting industries were allowed into these zones if they were subjected to regulation concerning, noise, pollution, smell, vibration, and smoke. Polluting industries were relocated to zones designated for extensive industrial development. Industries that went along with the zoning were categorised as collaborating industries while the one's objecting to the zoning were deemed non-collaborative and would not be permitted to the industrial zone once the master plan had come to an effect (Sharan 2010: 75-80).

However, the use of land and buildings that were lawfully established before the plan and the following regulation, but did not follow the regulation, would not be banned outright. Without the possibility to offer new suitable land and other incentives, the planners deemed strict enforcement of the regulations to have a negative impact on industrial development and thus in industrial employment in Delhi. A large proportion of the noxious industries were also so-called industrial shops, that could not be considered industrial units although they were noxious because of their small size

and service-nature. These shops were often in the residential areas, sourcing and selling locally (Sharan 2010: 75-80).

A review of the plan a decade later revealed that while the situation had improved in ten years, mixed land-use was still prevalent as the non-collaborating industries had hardly tried to move away from the residential areas while not a single flatted factory had been built to house the high-intensity small-scale industries, which had led to a further decline in the living-conditions of the residential areas. The plan had failed to acknowledge that a lion's share of Delhi's economic activities were unorganised and could not be set up by a complete segregation like in the western countries on which the master plan had originally been based on (Sharan 2010:77). Although this fact was recognised in the following master plan that was devised in 1990, the meat of the plan as far as pollution goes remained the same: the expulsion of some polluting industries, while containing other polluting industries. The plan did not outline how this was to be done, how pollution levels were to be lowered and what would those policies look like, leading 5 years complacency on the issue (Narain and Bell 2006: 1585).

Finally, in 1996, the Supreme Court started issuing orders to the local government to start implementing its own relocation policies thanks to the relentless filing of public interest litigation by different environmental groups and most notably by M.C Mehta, the original petitioner and a renowned public interest lawyer known for winning numerous landmark judgements in the Indian Supreme Court. By 1997, the category H industries (industries banned from Delhi: hazardous/noxious industrial units and large industries) had been successfully relocated, and by 1999 the Court mandated the removal of the last industrial units within residential areas. (Narain and Bell 2006: 1586, Sharan 2010: 78-79, M.C Mehta vs Union of India & ORs 1996). Through various judicial orders, the Court had managed to expulse 98,000 industrial units (Baviskar 2003:98).

5.3 Bridling the Traffic

Although the Supreme Court was crucial in relocating the polluting industries out of Delhi, it's involvement in Delhi's air pollution policies had begun in earnest already in 1985, after a private citizen named M.C Mehta had brought public interest litigation before the Supreme Court. Mehta had grown concerned over the ever-rising levels of pollution in the city and the local governments apparent lack of interest in solving the issue, and so, he petitioned the court to push the government ministries and related agencies directly into action by implementing the Air Act of 1981 (Narain and Bell 2006: 1584, The Air Act 1981).

The Air Act not only gave the government authority to enforce its environmental laws, but also delegated authority to the CPCB (Central Pollution Control Board) mandating it to draw the standards that the states would need to follow in relation to the improvement of air quality, or prevention, control, or abatement of air pollution, also enabling CPCB to take action based on those standards it had set. By 1986, the Court was demanding an affidavit from the Delhi government outlining the actions it had taken to curb air pollution. Accordingly, most likely in response to the court's involvement, government started enacting new environmental legislation: they amended the Air Act in 1987, and more importantly, put forward two different laws that would lay down the standards of vehicular emissions for both the manufacturers as well as users, and by 1990 these standards were in place (Narain and bell 2996: 1985, Sharan 2010: 81-88).

As the pollution levels continued to soar in to the 90's, the Supreme Court started pushing for more action. It asked the Ministry of Environment (MoEF), to set up committees charged with designing policies that could mitigate air pollution within Delhi. Three separate committees were set up in the end. The first committee recommended phasing out leaded diesel and shifting to compressed natural gas (CNG) as an alternative fuel. Following these recommendations, in 1994, the parliament passed a law promoting the use of alternative fuels, including CNG. The Court also ordered all the government vehicles to move to CNG fuelled cars. The impact of these decisions was unfortunately highly mitigated by the lack of any infrastructure that

would have been needed to be built to support this kind of shift to a different fuel (Narain and Bell 2006: 1586, Sharan 2010: 82).

The government was more successful in other arenas: leaded fuels were phased out by 1995 and the sulphur content in the diesel that you could buy within the city was lowered from 1% to 0,25%. MoEF issued mass vehicular emissions standards in 1993 that were unfortunately too lax to have any effective impact. To sum, while some measures worked, many others were abandoned or forgotten. As the quality of air continued to deteriorate, it became apparent that a more comprehensive approach was needed. The Supreme Court, in line with its earlier actions, issued a suo moto notice (action taken by the court by its own accord) to the Delhi government, demanding an action plan to curb the rising levels of pollution. Accordingly, in 1996 and 1997, the Delhi authorities, along with the central government, finally established a plan to slash air pollution through developing complete policies on air pollution mitigation. The plan included the introduction of CNG busses while phasing out older busses, improved public transportations system, and other vehicle emissions related regulations. In practice, the efforts were hampered by the upcoming election in 1998 as the authorities feared any meaningful action could impact their share of votes, and once again, the Indian Supreme Court stepped in to force the Delhi government to do something it had promised to do on a paper but had failed to do so in reality (Narain and Bell 2006: 1587). Emission norms were made finally mandatory for new vehicles in 1999 by a Supreme court order (Indian Express 1999).

A third committee was set up by the Courts order: The Environment Pollution Control authority (EPCA). EPCA was established partly in a response to the governments complaints about the Court exceeding its authority. EPCA would monitor the progress, develop new policies, and serve as a fact-finding well for the Court. EPCA could close, prohibit, or regulate any industry; stop or regulate any services like water; establish procedures and limits related to hazardous substances; fit vehicles with pollution control equipment. EPCA concluded in its first progress report (1998) that the government action on pollution had limited effects because of the rapid increase of new vehicles on Delhi's streets in relation to those that were being phased out. ECPA pushed for more drastic measures, which were finally mandated by the Court in July

1998 and by 2002, all diesel busses and commercial vehicles had converted to CNG (Narain and Bell 2006: 1587-1588, Sharan 2010:82-84).

6 Analysis

6.1 Policies Mitigating Traffic Pollution

There has been a considerable legislative and administrative attempt to curb pollution by aged or otherwise polluting vehicles during the recent years: an amendment to the 1988 Motor Vehicles Act was introduced in July 15 of 2019 in the lower chamber of the Indian parliament, Lok Sabha. The new bill aimed to amend the original act that provided a framework for the grant of licences and other permits related to motor vehicles, standards for those vehicles, and penalties for any violations of these forementioned provisions. Regarding air pollution, the bill enables the government to recall vehicles it deems unsafe for the environment, driver, or other vehicles. More notably, the act hiked fines for invalid Pollution Under Control (PUC) certificates from 1000 rupees to 10 000 rupees, from around 10 euros to over 100 euros. These certificates indicate that the vehicle in question has successfully undergone an emission test. PUC tests are mandatory in Delhi every three months for older vehicles and once per year for newer vehicles (The Motor Vehicles (Amendment) Act, 2019). On top of this, Delhi has had a stringent scrapping policy since 2018, that mandates all petrol vehicles older 15 years and diesel vehicles older than 10 years off the road (Delhi Government 2018, Roy 2021).

About air pollution, the aim of the amendment and the 2018 scrapping policy is to rid Indian roads of old polluting cars, promoting a switch to a generation of cars that use cleaner fuels and/or have proper emission controls in place, subsequently lowering the overall emissions from vehicles in Delhi. While the effect of these policies on air pollution have yet to be seen, as the rollout of new cars will take its time, some positive consequences are already evident. In 2019, when the new bill was introduced, PUC tests across Delhi three-folded (Business today 2019, PTI 2019). Yet at least one major and glaring obstacle for the successful implementation of these policies still exists: Delhi employs only six thousand traffic police officers (latest number from

2019), to manage and monitor the compliance of over 12 million registered cars (Statista 2021) on the roads of Delhi, a mountain of a task for a force that small.

Delhi has additionally displayed an extra effort to ensure that new vehicles entering the streets of its city won't be adding on to its pollution issue by adopting European standards of emission for new cars, two years ahead of rest of the India (ICCT 2020, Roychowdhury 2020). These new standards will also raise the price of diesel cars relation to the petrol cars because of the pollution control required in the diesel vehicles, hopefully promoting less polluting vehicle choices for the future (Salhotra 2016).

While the efforts to ensure that the emissions standards are followed, and that they set high enough to make an impact, are crucial, if the amount cars driving on Delhi's roads keep exponentially increasing year after year, it is difficult to imagine how the traffic's share of the pollution will lower. The number of registered cars on the roads of Delhi has almost doubled in the last ten years, going from 6.45 million in 2010 to a near 12 million now (Statista 2021). Coincidentally, emissions from traffic have held onto their position as the primary source of air pollution in Delhi (Lama 2020). Therefore, there needs to be a more comprehensive effort to shift the travelling habits of Delhi's citizens to favour public or active forms of transportation over transportation by an owned car. This means increased investments into infrastructure and roads as well as efforts to affect the travelling habits of Delhi's citizens when the infrastructure is there to support it (Sofia et al. 2020).

Because the forementioned failure to curb the number of cars of Delhi's streets, during the last five years, Delhi's government has had to use increasingly imaginative and ad hoc-based policies to curb the pollution when its levels are at their worst. The odd-even schemes were introduced respectively in 2016, 2017, and 2019. The scheme is a traffic rationing measure which allows cars with an odd number ending registration plate to drive on odd days, and those with an even number ending registration plate on even days. The purpose of the scheme is to lower overall pollution levels through reducing the congestion of Delhi's roads while at the same time supplementing the increased demand for transportation through a boost in public transportation, including more busses and more frequent metros (Business Standard 2021).

The policy has been used as a response for spiking pollution levels during the winter months when the $PM_{2.5}$ levels are at their highest in Delhi (Dantewadia and Padmanabhan 2019). Traffic emissions are the greatest of source of air pollution in Delhi, and so halving the amount cars on Delhi's streets does make sense on paper. The effects of the policy have ranged from minor to non-existent. A study into the effects of the 2016 odd-even scheme discovered that during its 15 days of implementation, while $PM_{2.5}$ levels did lower up to 10% in three different pockets, the gains were only around 2% to 3% overall. The significance of these percentages is further mitigated by the fact that the PM levels exceeded over 250 µg/m3 during this period (Chowdhury et al 2017). For some perspective, according to the WHO guidelines, $PM_{2.5}$ levels of 25 µg/m3 should not be exceeded more than three times per year (WHO 2015). A CPCB study looking into two different periods of the policy concluded that while the scheme is likely to contribute to some reduction in air pollution, it cannot be expected to have any significant impact by itself, thus a more comprehensive approach is needed for substantial improvements in the pollution levels of Delhi (CPCB 2017: 2).

As a policy, the odd-even scheme has been a reactionary tool that the authorities have used when the pollution levels have been at their worst. Its use has been fragmented and while the policy itself can make sense; it has been successfully used in other countries like China (Luo 2014); in Delhi, the effects have been lacklustre to say the least. Larger policy implications of the scheme have been insubstantial as it an emergency tool for the worst periods of pollution rather than a comprehensive policy to reduce pollution. The scheme has not been used since 2019 when the Supreme Court called it fittingly ''half-baked", criticising its ineffectiveness on the overall pollution levels (Financial Express 2019).

After scrapping the odd-even scheme, in 2020, the Delhi authorities introduced a new campaign: "Red Light On, Gaadi Off". Under this new scheme, government officials from the transport department and the traffic police, alongside with environmental volunteers, would urge drivers to turn off their vehicles while they were waiting for the traffic light to turn green. The period for the campaign was between October 21 and November 15, addressing the same seasonal pollution spike that the odd-even

scheme attempted to curb before. The volunteers would ask drivers to turn off their engine if they had to wait for more than 15 seconds. Around 2500 volunteers participated along with the officials from the traffic police and the transport ministry, covering 70 constituencies, staying by 100 different traffic signals within Delhi (Economic Times 2020). The aim of the campaign is to lower overall pollution levels through behavioural change in drivers' habits. The Delhi government claimed that the campaign could reduce vehicular pollution around 15-20% (Dey 2020), based on a 2019 study into idling fuel consumption and emissions of air pollutants in Delhi. The study claims that if 10% to 75% of drivers in Delhi shut off their engine when idling, the idle fuel consumption could be lowered from 8% to 70% with corresponding lower emissions as well (Sharma et al. 2019).

While there have been no studies on the immediate effects of this campaign, experts have been pointing to the many conspicuous inadequacies of the policy: bulk of the traffic signals by which the volunteers stood by turned red for only 20 seconds. An expert from the World Resources Institute, Amit Bhatt, explained that the vehicle needs to stop for at least minute for it to bring any benefit in relation to air pollution. The other issue is the fact that some of the signals in Delhi do not have timers, which makes predicting the time of the signal difficult for the driver, incentivising them to keep the engine running. Lastly, Delhi's roads are full taxis and other four-wheels that are so poorly maintained that the drivers must worry whether the vehicle will restart on time (Lalwani 2020).

One must also think about the efficacy of exposing thousands of volunteers to the worst pollution levels the city has to offer. Volunteers interviewed by Indian media have reported developing respiratory issues during the campaign (Lalwani 2020), which unfortunately is no surprise: a study into the pollution levels in auto-rickshaws in 2011 discovered that the exposure to PM on the roads Delhi is sky scraping: 190 µg/m3 $PM_{2.5}$ on average, concluding that one daily commute with an auto-rickshaw exposes the traveller to more particles in Delhi than a whole day of exposure for a urban resident living in megacity in a high income country (Apte et al. 2011). And so, even if we forget all the apparent inefficiencies of the "Red Light On, Gaadi Off" -

campaign, having these volunteers stand by these hotbeds of poison from 6am till 2pm cannot be a sustainable solution.

6.2 Crop Burning: State Solutions to a State Problem

While crop burnings overall contribution to Delhi's yearly air pollution is not overtly significant, it is the largest single source of pollution during the worst months of the year in late October and November when the pollution levels are at their worst.

The origin of this practice can be traced five decades back to the Green Revolution in India in the beginning of 70's, when farmers in Punjab and Haryana were incentivised to start practicing ecologically unsustainable wheat-rice crop rotational system. India's food security was greatly improved, but the issue was, and is, the fact that while the two states produce most of the country's rice, their climate is inadequate (too dry) for rice farming. Subsequently, the groundwater levels in the two respective states have plunged, forcing the government to mandate the farmers to sow rice only during the Monsoon season - June and July - when there is plenty of rainwater. This in turn pushed the harvesting season of rice to October and early November, but as the wheat needs to be sown by mid-November, because any lags in the process will invariably affect the quality of the crop, the farmers are left with 10 to 20 days to clear their fields of the footlong rice stalks that their modern combine harvesters leave behind. The easiest, fastest, and cheapest solution is burning of the fields, clearing the paddies in no time, while simultaneously polluting the air in downwind (Bhowmick 2020).

In Punjab, from where a large share of the crop burning related pollution originates (ET 2020), the Punjab Pollution Control Board (PPCB), Punjab State council for Science and Technology (PSCST), and Punjab Energy Development Agency (PEDA) are the three actors with vested powers manage the pollution. In 2005 when it was first becoming apparent that the paddy wheat rotation was not only drying up the ground water reserves, but also depredating the soil and leading to accelerated erosion, the Punjab government created the Agricultural Diversification Fund and laid out a new plan with an around seven-million-dollar annual budget to diversify Punjab´s

agriculture and further strengthen its infrastructure. An Agricultural Research and Development Fund was also established alongside with several councils for different crops. The aim of the said policies was to diversify Punjab's agricultural sector, shifting from the unecological low value produce of wheat and rice, to high valued products and organic farming. The aim was to transform one third of their agricultural sector in ten years (Kumar et al. 2014).

By 2006 task force by the PSCST was coming up with a plethora of activities to curb crop burning from diversification of the crops to alternative uses of the agricultural residues. By 2008, thousands of farmers attended training camps, awareness campaigns were set up to incentivise the farmers to adopt newly tools that dealt with the rice stalks, which were also subsidised by the government. Many initiatives were set up to deal with the agricultural waste over the years, from feeding it to animals or using it as bedding, to burning the stalks in bio thermal power plants. Also, government contracts were given to farmers, covering half a million of acres, to diversify their crops either to fruit or other plants (Kumar 2014). Yet still, after over a decade of a flurry of activities, the number of registered incidents of crop burning are still on the rise in Punjab (ET 2020).

While the shift to unecological farming during the Green revolution can be seen as the first mistake, the 2009 subsoil acts that were enacted in Punjab and Haryana, and the federal government's agricultural procurement policies, are the real culprits behind severity of the contemporary situation (IELRC 2009, The Punjab Preservation of Subsoil Water Act, 2009).

The reality that almost the entire state of Punjab is under irrigation (Indian Ministry of Agriculture 2021) and that most of its agricultural sector constitutes from water intensive rice farming - in an environment that is unsustainable for it - led to an inevitable water crisis by 2009. The government response was to prohibit sowing before May 10 and transplanting before June 10. The aim of the policy was to delay the seeding for paddy fields to reduce the amount of water the process required. Through avoiding the excess evaporation of water during the months of April and May, the Punjab government effectively reduced the amount of water the paddies

needed by over a half. While the water levels recovered, the unwanted ramification of the policy began to manifest itself. The gap between the time to harvest the rice and clear the fields before the next crop had to be planted in tightened, which in turn further incentivised farmers to burn the foot long rice stalks that were left on their fields after the rice was harvested on to plant the next crop on time (Jain 2019). While to Water Acts did effectively stop the desertification of Punjab and Haryana, they did not even attempt to address the root cause of the issue, the farming of rice in an area that is totally unsuitable for it.

Accordingly, a total shift from rice to wheat, or to other fruits and plants is needed. Not only is the area more suitable for wheat, but India's central and Eastern regions are far more suitable for paddy farming. Despite of the variety of different schemes and efforts to diversify the agricultural sector, the farmers have been reluctant to do the switch, mirrored in the fact that 90% of the farming in Punjab is made up by the unsustainable wheat and rice -cycle (Jain 2019). This is no incident, as the efforts to diversify the agricultural sectors of Punjab and Haryana have been widely mitigated by central governments procurement policy.

In India, the state acts as a sort of middleman or a buffer between the market and the farmers, ensuring that that farmers are paid a certain minimum for their products. Through this 'mandi system', the farmers in Punjab and Haryana have sold their wheat and rice to government-controlled wholesale markets for a guaranteed price. The central government procures 75% of all rice and wheat produced in Punjab and Haryana, reflecting how 45% of all rice and wheat procured by the Indian government comes from these two states. But this practice might be changing soon: the Indian parliament passed three bills in September 2020 which in effect would enable the farmers to go directly to the market to sell their product. A move that has invited thousands of protests across India, as farmers are fearful to lose the economic safety the mandi system offers (BBC 2021).

And so, the central government along with the state level governments, have been the main actors in sustaining the unsustainable cycle of wheat and rice farming in Punjab and Haryana, being the main architects of the negative consequences that

have followed through their procurement policies as well as the subsoil acts (Jain 2019, Radhakrishnan et al. 2020). Any gains through some policies have been counter-acted by others, farmers have been encouraged to diversify their produce while at the same time their old produce is being bought at a guaranteed price. When Delhi's skies darken once again in October, the fault is not with the farmers in Punjab or Haryana, but with the state and federal levels of government.

6.3 Industries

There are 12 coal powered thermal plants within 300km radius of Delhi (Abraham 2021). Emissions standards for these plants were put into place in December 2015 by the MoEF&CC. The standards cover sulphur and nitric oxides, mercury, and water use. The requirements cascade depending on whether the plants were established and installed before 2003, after 2003 or after 2017 (Sinha 2015). The application of the standards can vary depending on the size and capacity of the plant in question: smaller plants have more lenience with the flue-gas desulphurisation (FDG) technology, a set of technologies that remove sulphur dioxide from the exhaust flue gases of coal powered plants, because of space constrains (CPR 2018).

The aim of these standards was to directly curb the baseload of air pollution in Delhi and NCR. Unlike crop burning or other seasonal polluting activities, like fireworks during the celebration of Diwali, these plants pollute the air around the clock, throughout the year. A study into different sources of pollution in the Delhi-NCR in 2016 estimated that a 90% reduction in sulphur dioxide emissions from these plants would lead to a 72% reduction of sulphates in the air in Delhi, a reduction in PM10 and PM2.5 concentrations by about 62 µg/m3 and 35 µg/m3. Similarly, a 90% reduction in nitric oxide emissions would lead to a reduction of nitrates by 45% bringing about a reduction of PM10 and PM2.5 levels by around 37 µg/m3 and 23 µg/m3 (Sharma and Dikshit 2016: 277).

Unfortunately, the thermal plants have categorically failed to adhere to the deadlines placed by the emission standards. The first deadline was set to the end of 2017, but only a year after the deadline was set it was already apparent that there was no

resolve to follow through with the regulation. As a response, a non-profit environmental organisation called Legal Initiative for Forest and Environment began a preemptive legislative push to ensure the standards were followed by the end of 2017. Following the judicial process, MoEFCC reported on an affidavit that it would make the operators of the noncompliant plants criminally responsible. CPCB also gave guarantees of compliance. However, it also became clear that MoEFCC nor CPCB had any mechanisms to enforce compliance, the whole process depended on the plants themselves to report on their compliance or incompliance. By November of 2017 MoEFCC was asking the Supreme Court to enforce compliance. Instead, less than a month before the deadline, the Supreme Court moved to extend the deadline by five years. A peculiar move considering it made sure that the new deadline could not be challenged through the lower courts (CPR 2018).

Regarding the power plants in Delhi NCR, the deadline was moved to December 2019. By April 2018, most of the plants were either at the very preliminary stages of their assessments, or not even that. The same lack of monitoring that had led to inaction before, unsurprisingly, led little to no action this time again. The government was forced petition the Court in December 2018, pushing the deadline to 2022. The reasoning given was lack of monitoring, and tightness of the schedule, which was curious considering that the regulation had been out three years at this point (Pathania et al. 2018).

The consequences of this regulatory failure are immense as the contribution of these power plants to the overall pollution levels in Delhi is massive. Centre for Research on Energy and Clean Air (CREA) conducted a study into the health and economic impacts of the unbated coal power generation in Delhi-NCR. The paper estimated the additional economic costs from lack of filters and other purifying technology in the plants, through health costs, reduced productivity, welfare et cetera, is at around 600 million dollars per year. Further, 218 deaths could be avoided in Delhi annually, while 682 calculated deaths could be avoided in the Delhi region at large (Dahiya and Myllyvirta 2021).

The same lack of supervision and monitoring that has stalled implementation of regulation in Delhi-NCR's power plants, has plagued Delhi's mitigation efforts in relation to its polluting industrial units. A study by the Centre for Science and Environment (CSE) investigated the air polluting industries within the Delhi region. Through calculating the pollution load of the industries by studying various areas based on calculations about their fuel use and combustion equipment, the study was able to map out the polluting industries of Delhi-NCR and the challenges the state has had in curbing their emissions (Narain et al. 2020).

Sr. no.	Industrial cluster/region	No. of units	Major industrial sectors
1	Alwar	156	Chemicals and food processing
2	Bhiwadi	328	Metal and chemicals/pharmaceuticals
3	Gurugram	125	Textile
4	Faridabad	948	Metal
5	Panipat	231	Textile
6	Sonipat	390	Textile
7	Ghaziabad	146	Textile

Figure 5 CSE 2020 Air Polluting Industry Profile

The report found that food, textile, and metal industries were contributing 92% of the overall pollution load in the industrial clusters, implicating that a meaningful enforcement of regulation regarding those three industries could bring forth an impactful change. Regrettably, the report also notes that the Pollution Control Boards do not have enough capacity to enforce their own rules and regulations, lacking in both manpower and monitoring technology (Narain et al. 2020:26-27).

A study by a Delhi based non-profit, the Centre for Chronic Disease Control (CCDC), conducted several extensive interviews with officials from the control boards, further explaining the lack of regulative poise with the respective organisations: they found evidence of systemic staff shortages, increased workloads, poor conceptualisation of the health impacts of pollution, and poor coordination with other agencies. More glaringly, the board officials often perceived the organisation as a technical advisor instead of regulatory body (Bahuguna and Krishna 2020, Tripathi 2020). There is a great chance that if the workers of a regulatory body do not view the organisation as such, the quality of its regulative work will reflect this.

Yet, there have been some major steps forth: in 2019 70% of the industries were using either wood, coal, liquid fuel, or bio-based fuel, while only 3% had switched to PNG (Narain et al. 2020). By January 2021, Delhi had shifted 1607 out of its 1644 polluting industries to PNG, which can be seen rightfully as a major step to clean up their industrial pollution load (Pillai 2021). Delhi has also made sure that no new manufacturing units will be allowed into its new industrial zones (India TV 2020).

The main difficulty within the context of Delhi-NCR in assessing the industrial pollution, as well as in evaluating the effects of the mitigation action, is the lack of information. To demonstrate, while there is regulation towards brick kilns by the CPCB: they can operate only when the air quality is not 'severe' and only between March and June, while also having to maintain a 500 meter distance to other units (New Indian Express 2021), there is little to no data on the amount of these kilns and on other the scale of other small sectors, making the evaluation of their overall environmental impact, and the overall effect of mitigation action towards them, impossible (Narain et al. 2020: 24).

To this end, in a ruling by the India's National Green Tribunal (NGT), a tribunal made for environmental cases a decade ago by the Supreme Court, a mandate was put forth requiring all pollution control boards to chart and monitor the emissions of industrial units under their districts onto a public monitoring system by the end of April 2021. The CPCB first directed all the state boards to use these OCEMS- monitoring systems (Online Continuous Emissions/Effluents Monitoring Systems) in 2014, and in 2017, the Supreme Court demanded these monitoring systems to be viewable online for the public. However, by 2020, 32 boards had not fully complied with the order, and in the case of Delhi, 101 monitoring stations were online while 45 were still off the internet (Aggarwal and Singh 2020), forcing NGT to enforce the court order (Lavakare 2021).

The greatest possibility within an extensive and open access to pollution monitoring information is how it can empower residents and local organisations: a real time monitoring of pollution would enable citizens to assess their exposure to pollution and inform them on the sources of pollution within their neighbourhood. Knowing

exactly what units are polluting and to what extent in your neighbourhood will turn making demands on your local leaders easier, as you are able to point to the exact issue at hand. First step of solving an issue is to be aware of it, especially when you are dealing with an invisible killer like air pollution.

Similar systems are already in place within the EU and US: In the US, the Environment Protection Agency (EPA) makes industrial pollution data from all monitoring locations free and available to the public. The European Environmental Agency maintains the European Pollutant Release and Transfer Register (E-PRTR) which harbours industrial pollution data from over 34,000 industrial facilities across the EU (European Pollutant Release and Transfer Register 2021). Environmental organisations within the EU have been able to use this data to first identify the air polluters in their areas, and then hold them accountable. These datasets were first made available in 2007 and industrial emissions have been going down within the EU ever since. (Bhattacharji 2020, Lavakare 2021).

The CPCB and all the respective the state control boards are the entities responsible for the OCEMS-system, which is why it is mandatory for these organisations to have the capacity to be able to maintain these datasets of polluting industrial units, which means they need to have enough suitable manpower as well as the right technology. If an organisation is lacking resources to the point where even its own employees are confused about its mission (Bahuguna and Krishna 2020), some changes need to be made. The other self-evident issue with the monitoring right now is the fact that the commission and operation of the monitoring itself is left to the same industries these systems are supposed to be watching over. The system in effect gives the jail key to the convict, enabling the polluting units to enter double-entries into the OCEMS-database, sharing one set of data with the regulator, while maintaining the actual set of data for internal monitoring, distorting the shared information, making it unreliable and subjective (Bhattacharji 2020, Lavakare 2021).

6.4 Dust Particles

Construction generates a high amount of PM through several onsite activities such as excavation, drilling, bulk material transportation, loading and unloading, storing outside, concrete and mortar making, cutting, and filling, and moving all the equipment needed for all the forementioned activities (Xin et al. 2018). Other primary sources of dust are unpaved and poorly managed roads and pavements as well as brick kilns. Delhi has consequently put regulation in place for all of this, from how construction material and waste must be stored and transported, to the use of water guns and other equipment during the construction (Kumar 2018).

While Delhi has a record of sending strongly worded letters to constructors, issuing fines, and installing smog guns (Tiwari 2020, IANS 2020, PTI 2020), dust remains one of the main sources of pollution in Delhi, especially during the summer (Mishra 2020). The same issues that pest abatement of industrial pollution are also evident here. Primarily, the lack of a comprehensive supervision of existing regulation. As Delhi will continue to expand both demographically and economically, the demand for more construction activities will follow along, which in turn will lead to more dust in the air if the existing regulation is not enforced. While Delhi's authorities have promised a stricter campaign to control dust through fines and more intense supervision, spot-checks into various locations have showed that proper dust control measures are severely lacking, from the maintenance of roads to the storing of construction waste and other materials. Compliance is not adequately enforced and timelines for the projects are often missing, making proper inspections difficult to do. More alarmingly, dust control measures were flouted over on government sites and private ones alike (Babu 2019, Babu 2020, Mohd 2020). The extent of the situation becomes more evident from the use of a government launched app at the end of 2020, made for the citizens of Delhi to complain about environmental issues within the city, the Green Delhi mobile app. Within a month after the launch of the app, it had registered over 5000 complains over dust pollution (Babu 2020).

The failure to control construction related dust through regulation has resulted in now already familiar ad hoc policies that are put into place when the pollution levels

are at their worst. Throughout the three last Novembers, in 2018, 2019 and 2020, construction activities were completely banned as a part of an emergency tool called GRAP (Arora 2020, ET 2020, PTI 2018). The Graded Response Action Plan (GRAP) is an emergency action plan for Delhi-NCR that has been in in use since 2017. The action plan was approved by the Supreme Court and conceived through several meetings the Environment Pollution Authority (EPCA) hosted along with state representatives and experts. The plan doesn't include any separate action by different state agencies, being solely a graded action plan that gets put into effect when the pollution levels go from 'poor' to 'very poor' or worse (Indian Express 2020).

The actions cascade along the pollution level: first at 'very poor' ($PM_{2.5}$ 121-250 µg/m3 or PM_{10} 351-430 µg/m3) a blanket ban on diesel generators is issued along with an increase to public transportation and parking fees; at 'severe' ($PM_{2.5}$ over 250 µg/m3 or PM_{10} over 430 µg/m3) brick kilns, stone crushers and hot mix plants are closed; and finally at the emergency level ($PM_{2.5}$ over 300 µg/m3 or PM_{10} 500 µg/m3 for more than 48 hours) trucks are denied entry into the city, construction work is banned, the odd/even schemes were introduced in 2017 and 2019, and usually also the schools close down (Indian Express 2020). Delhi's pollution levels have reached the emergency level every year after the action plan was introduced during the worst months in October-November subsequently shutting down all construction activities for that period. (Schultz and Raj 2019, Reuters 2019, PTI 2020). While the effects of the policy are impactful in the shot-term, it is no solutions to the issues at large. Ironically, GRAP represent all the earlier failures to control the situation, leading to drastic, and absolutely needed, measures that impact many lives: millions of jobs are put on hold, from construction to logistics, while the children of the city miss school for weeks.

Aside from the obvious need to properly fund and build up the capacity of the organisations that supervise the regulation covering construction activities, brick kilns, and the roads of Delhi, some lessons can be learned from the local governments in China where some cities have managed construction related pollution more effectively (Xin et al. 2018). A framework of five different categories has been widely used in China, focusing on technology, economy, supervision, organisation, and assessment. While

the economic measures the state can use to incentivise constructors to follow regulation are important, technological measures have had the most significant impact in China, as they can guide the constructors to reduce dust in a clear-cut way while also making the effects of the mitigation efforts easier to see. The technological measures have included mandatory sprinkles that inhibit fugitive dust, local exhaust ventilation to decrease dust, ban on field mortal and concrete - shifting to ready mixes, mandatory ground surface hardening or covering, and requiring vehicle washing (Xin et al. 2018: 10-13).

The effectiveness of these measures is still dependent on their enforcement and supervision, the supervisory measures common in China includes third party supervision, mass media supervision, video monitoring and measuring public complains. Organisational action has compromised of establishing a steering group and a joint conference system, which both bring clarity to the responsibilities of primary stakeholders, the contractors, and builders alike. Governments have also offered education and training to construction managers to ensure they are on the same page with regulation as well as introducing and delivering relevant technologies to employers to combat dust. Lastly, assessment-based measures have been in use to provide feedback to government contractors in assessing their dust control on site. These measures also include streamlining dust into other green construction initiatives (Xin et al. 2018). While China can offer a clear path to better mitigation action, adequate resources and capacity are still required for any meaningful repetition of their actions. Within the Indian context, third party monitoring is especially essential: whether looking at Delhi's history regulating thermal plants or polluting industrial units, self-monitoring has not worked.

7 Findings

The worst period of pollution in late October and November can be considered as the sum all of Delhi's, as well as the federal and state governments, failures to address the overall air pollution issue. It is likewise the coming together of its environmental action's most ineffective, temporary, provisional, and partial parts. The pinnacle of

all the ad hoc state-fixes that the state could pile on top of each other, from the odd-even schemes to the Red Light On, Gaadi Off campaign, from the closure of all construction activities and schools, to heavily raising traffic tickets (Indian Express 2020).

While the baseload pollution during this time consists of the usual suspects: the unfiltered thermal plants, the self-monitoring polluting industrial units, the self-supervised construction sites, and from the ever-expanding fleet of vehicles on Delhi's roads, around 40% of the PM matter in the air is from crop burning, the practice state policies have created and sustained (SAFAR-India 2018). Consequently, in November when the schools close, when the plants and kilns are shut, when another goofy traffic policy is implemented, when all construction activities are stopped and stores are running out of inventory because heavy vehicles are banned, and when a dark smog engulfs the sky and hides sun while the PM levels soar over 12 times over the 24-hour mean level WHO guidelines, the primary entity at fault is the state.

Accordingly, crop burning exemplifies how the contestation and continuity of environmental issues, at the following abatement action, can be largely, or in this case, wholly located within the constrains and possibilities of the (capitalist) state.

Crop burning as a considerable polluting practice emerged from a series of failures to consider the environment in decision-making: the possibility to increase productiveness of farming in Punjab and Haryana through incorporating rice into the farming cycle weighted over the environmental realities of these places. As the impending environmental consequences began to surface the root cause of the issue was not addressed, the unsustainable farming of rice, instead, a quick fix was applied through artificially changing the time of sowing and planting. Here again, the possible environmental consequences of the policy were ignored, the fact that farmers would be driven to burn their fields to plant the next crop on time. Now, instead of turning the states of Punjab and Haryana into a desert, the consequences of unsustainable farming in Punjab and Haryana are poisoning the air downwind.

Here lies the reason why all the policies to mitigate crop burning have either failed or made the situation worse. While there has been an extensive rationalisation of the measures to curb the crop burning as a practice, from reusing the stalks in several

different ways to offering new tools to the farmers that enable them to clear the fields without burning them, none of these fixes have addressed the root cause, the unsustainable farming itself. The policies that do attempt to address the source of the issue and push farmers towards diversification of their crop, are met with a federal government policy that economically incentivises these same farmers to keep farming rice and wheat.

Correspondingly, crop burning in Punjab and Haryana is a demonstrative case of the kind of eco-capitalist environmental statehood Antonio Ioris describes in his book (Ioris 2014: 14).The contemporary state runs into an ontological dilemma: it cannot distance itself from class politics, in this case the farming and procurement policies it promotes in Punjab and Haryana, nor can it stop these class conflicts from affecting the socioecological systems, the air quality of Delhi and the groundwater levels in Punjab and Haryana before that. The state must balance between the economic worries and priorities of the farmers who depend on the procurement system and the valuable rice-wheat rotation, against the environmental externalities of these systems, prioritising the former.

The result has been a categorical failure and refusal to address the root cause of the issue, instead, applying band aid fixes one after another. The negative outcomes of accumulation are resolved in a way that does not impede further accumulation. Fully rationalising the measures needed to tackle effects of the issue, while totally misrepresenting the issue itself. Illogical measures that contradict one another, e.g., pushing farmers to diversify their crops while simultaneously still buying out the same crop you want them to stop farming.

The state creates the problem, or at the minimum is heavily involved in creating it, and actively sustains it, being subsequently forced to come up with a laundry list of ad hoc policies to mitigate the mountain of unaccounted externalities of its own actions, from air pollution to desertification, whilst absolutely ignoring the main source of the whole spectacle. And in the end, the economy takes priority over people's right to breath.

There are some important lessons to be learned. To surpass the superficial and temporary nature of contemporary state environmental action, analysing and criticizing state environmental policy is not enough, it is crucial to also question the rationality and commitment behind those policies. Not only in the case of crop burning, but if we are to look at regulation concerning construction, thermal plants and the industrial units in Delhi, the lack of commitment is apparent by the fact that these entities have been let to monitor themselves unsuccessfully for years. Again, balancing between economic interests of the city, cheap energy from unfiltered coal plants, uninterrupted construction, and the production of its over 1600 polluting industrial units, and the socioecological consequences of inaction, has led to this tragic situation, where hundreds of people are dying and thousands are being hospitalised every year because of Delhi's inability, or the lack of commitment, to properly regulate these entities (Dahiya and Myllyvirta 2021).

When the abatement efforts are dislocated from the root cause of the issue, or if the actors are not committed to those efforts, the following abatement action will be as it has widely been in Delhi: partial, ineffective, provisional, and temporary.

The Indian democracy fortunately enables viable and effective solutions to the reorientation of the state of air mitigation policies in Delhi. One of the main issues of air pollution is with its physical constitution, people might not be as aware of it as they would be of a less translucent environmental issue, such a foul-smelling polluted river, which underlines the level of impact an open source for real time pollution information could offer in a democratic country like India.

An open, real-time, transparent, and readily available pollution data could empower the citizens of Delhi to combat air pollution more effectively. Real time monitoring of pollution that covers the city and the Delhi-NCR could offer a great insight to the citizens on how much the air pollution in their area could affecting their health, thus inviting more action by the residents and local environmental organisations to pressure authorities and local leaders to get on with it. The pressure the respective industries are putting into the authorities to let their polluting practices fly, must be met with at least an equal push by citizens demanding their right to be able breath. A

valuable tool for change would be the ability for the concerned citizen to be able to point exactly at the issue through a comprehensive air polluting monitoring system. The same success polluting industrial units monitoring has seen in Europe, could replicated in Delhi (Bhattacharji 2020, Lavakare 2021).

The lack of proper monitoring systems and the contradiction ridden piecemeal approach to air pollution mitigation demonstrate the need to enhance policy coherence and consistency. OECD defines policy coherence as the systemic promotion of mutually enforcing actions across government departments and agencies creating synergies achieving the agreed objectives. More specifically, policy coherence for development (PCD) is an approach for integrating economic, social, governance, and environmental dimensions of sustainable development at all stages of domestic and international policy making (OECD 2015). At the general level, both Coherence and Consistency refer to the lack of and freedom from contradictions, while consistency is static, coherence is something that manifests in different scales. Both are interdependent (Stocchetti 2013: 38-50).

The approach works in two-folds in this case to attain internal and external (broad) coherence: first in discussing policy coherence in conceptualising and planning air pollution mitigation action, and second, in analysing economic and other policies, like the state procurements policies in Punjab and Haryana, in the context of the air pollution issue. Narrow coherence is not sufficient in the case of air pollution, as the issue originates from other sectors (Hoebink 2004). Lastly, the reason why proper monitoring systems are so essential for policy coherence, within the context of combatting air pollution, is the fact that ultimately the success of policy depends on the reliable translation of policy goals into clearly defined targets that are quantifiable, and the ability to be able to observe these quantifiable targets in this case depends largely on the existence of proper monitoring systems (Coscieme et al. 2021). It must be admitted that an additional challenge for policy coherence is nature of Indian democracy: the governing parties in Delhi, in Punjab, in Haryana, and on the federal level, are all different, leading to yearly bickering over the blame and accountability over the situation (Adak 2017, Chanakya 2020, Lakshmi 2019).

The findings correlate with earlier studies, but some of the conclusions do somewhat divert. The active role of state is as apparent now as it was during the earlier research, but the kind of middle-class bias Baviskar (2003) and Véron (2006) describe in their papers regarding the Indian courts was not so evident in this study. The courts play an important role in pushing the state into action in India and Delhi, but they cannot be considered an independent policymaker, as they have not acted by themselves or by their own accord. While the courts have pushed many policies into implementation, they are not the source any policy and their impact is limited to the policies the state sets or has already set. The courts have either demanded the government to come up with new policies, like after the failure of the odd-and even schemes (PTI 2019), or to implement already existing policies, like the regulation on thermal plants (Pathania et al. 2018). Through doing this, the courts not only give the politicians a way to avoid direct responsibility for implementing disliked policies, a system similar to how higher courts function in the U.S, but also makes sure the state is actualising its own decisions. In the EU, the use of courts to push environmental action based on already existing laws and policies is a common practice (European Commission 2021).

As a phenomenon urban air pollution ontologically decapitates the dichotomy of nature and society. Urbanisation and economic expansion produce a socioenvironment where not only the technologies, infrastructure and amenities are distributed unevenly (Swyngedouw and Kaika 2014), but even people's ability to breath is affected by their socioeconomic status. Well paid jobs are hidden in airconditioned offices, while a bulk of India's informal sector, which encompasses around 83% of the workforce of India (Mohanty 2019), is working by the polluted streets. This manufactured environment is produced partly by the state through its mediatory role between the society and rest of the nature. When economic behaviours like rice farming are prioritised over mitigating the environmental impacts of the said practices, and when desperately needed regulation is not being enforced, the state is actively taking part in producing the deadly environment its citizens must live in (Moore 2015: 37-38). The case of Delhi's air pollution represents clearly how separating the economy, or the society, from the environment is wrong both analytically and synthetically: you

cannot exclude the air you breathe from any activity you do unless you are living in space.

To sum, state attempts to create visible and socially acceptable solutions to the environmental contradictions the economic growth it promotes has created, while protecting the long-term socioeconomic objectives of the strongest stakeholders (Ioris 2014: 24-27). In Delhi, this growth has come in the form of ever-increasing population and number of cars. The growth in population has been matched by a similar boom in construction, while increasing energy demands have been supplied through unfiltered, polluting coal power (Kapil 2020). To top it off, economically lucrative rice-wheat cycle and the following state policies to curb its environmental consequences have created a situation, where the farmers must burn their fields in Punjab and Haryana, further adding onto the pollution problem of Delhi.

The policies that have attempted to curb the negative consequence of this accumulation have manifested the resilience and creativity of the pertaining economic structure. There has been an extensive rationalisation of the measures, from a catalogue of banned activities, energy sources, and so on, to multiple different ad hoc policies from curtailing the amount of traffic, to public educational campaigns. Yet, the measures taken have not adequately addressed the overall pollution problem, a fact that is the most evident in late October and November when the situation is at its worst (Ioris 2014: 25).

Delhi´s mitigation strategy has been an exemplative instance of the kind of utopian thinking that plagues environmental action and economics. Ambitious European car standards are implemented while the number of cars on the roads keep increasing every year along with the levels of emission. A wide range of technological solutions and innovation for using rice stalks are being introduced along with educational campaigns, while ignoring the ecological stress the current farming practices are exposing the soil and its water reserves to and the impacts of earlier legislation on the farming practice itself. Effective regulation and policy coordination make way for wishful thinking - market solutions (Gills and Morgan 2020, Spash 2020: 14, 17).

Delhi also captures the tension between private and public demands stemming from uneven patterns of growth, and the contradictions of the following environmental statehood, highlighting the reluctancy, and inability, of the state to address environmental issues in terms of representing the whole society (Ioris 2014: 26). On paper, the measures look to improve the situation, but in practice, the activities are heavily constrained, and in the case of regulation, hardly enforced. Environmental politics and the following rationality of the environmental management is highly contained within the struggle to control the state and its functional capacities. This should be noted by future studies; you cannot separate state's environmental action from its ontological orientation, and from the ideological, political, and material contractions private property puts on it.

This further demonstrates the importance of democracy in effective management of nature. The civil society's pressure to action must meet the pressure to inaction by the polluting entities. Public awareness is crucial for this, according to socioeconomic surveys, sanitation and water supply remain the greatest priority for Delhi's poorest citizens' (Véron 2006, Siddiqui and Pandey 2003), stemming from how painfully obvious it is when these things are missing. While air pollution does not impede daily routines, needs or behaviours, nor does it stank up the neighbourhood, its consequences are far reaching and drastic. With open, transparent, and real-time monitoring this invisible killer can be turned visible, which in turn could empower citizens to exert more pressure on the state. If the political balance favours meaningful air pollution mitigation action, it will happen.

8 Conclusion

Despite a wide range of covid restrictions that limited traffic and other sources emissions greatly throughout the year of 2020, Delhi´s annual $PM_{2.5}$ average was still six times over the WHO recommended level and led to an estimated 54,000 premature deaths (Arora 2021). Moreover, toxic air has killed more Indians year after year: it was estimated that in 2019 around 1.67 million Indians died because of pollution

related causes, constituting 18% of all fatalities in India, while in 2017, the respective numbers were at 1.24 million and 12.5% (ISDBIAPC 2021).

The reasons for Delhi´s plight are multifaceted: an unfortunate geographical location; extreme growth in the number of residents from early on, originally stemming from the separation of India and Pakistan, that made the development of the city sprawling and chaotic; the massive influx of residents has been met with an equivalent boom in (poorly regulated) construction, while the number of registered cars on the roads of Delhi´s has increased exponentially year after year; over 1600 (self-monitoring) polluting industries in the Delhi NCR-region, including 11 unfiltered coal-fired power plants that alone constitute around 7% of all PM matter in Delhi´s year between October and January (Economic Times 2021); and the yearly practice of crop burning, originating from state laws that mandate a belated time for sowing and planting in order to preserve the groundwater in Punjab and Haryana.

This thesis set to found out two things: How Delhi´s environmental action has reflected the theory of Antonio Ioris on the environmental statehood? And more generally, to what extent do state interventions fail to address, further, or even create environmental issues due to the contradictory positions they hold with respect to accumulation and environmental protection?

Ioris argues that because of the productivist and privatist priorities of the state (anti-commons obligations), its environmental action is limited to temporary “state-fixes” that only address the most severe cases, thus being unable to produce any long-term solutions to the environmental issues it is trying to resolve (Ioris 2014: 28-31). This has been largely the case in Delhi. The mitigation actions have been predominantly ineffective in curbing air pollution and the only times the state has been able to muster comprehensive, extensive, and impactful pollution mitigation action, the GRAP-approach, is when its back is already against the wall and the city is literally covered is thick smog. And even then, the policies are only implemented temporarily to only cover the worst months of the year.

In relation to irrational, contradicting and illogical state action, the supervision and regulation of polluting industrial units, unfiltered coal plants and construction sites,

as well as the policies curbing crop burning, have been illustrating to say the least. Even if forgetting the fact that the Pollution Control Boards do not have enough capacity to enforce their own rules and regulation due to the lack in both personnel and monitoring technology (Narain et al. 2020:26-27), if the employees of the primary entity overseeing regulation, the pollution control boards, view the organisation more as a technical advisor than a regulatory body, there is something inherently wrong with the mitigation action (Bahuguna and Krishna 2020, Tripathi 2020). But this is no accident, when the state is primarily interested in creating the perfect conditions for accumulation, relegating national environmental agencies into a role of secondary importance over long-term issues such as economic growth or employment comes naturally. Instead of regulating the polluting entities, the environmental agencies are instead giving them advice, and leaving the (self-)monitoring of regulation to the polluting entities themselves (Altvater 1972, Ioris 2014: 10, Jessop 1977: 356-361).

The state finds itself in a contradiction, it must abolish the capitalist mode of production within the capitalist mode of production itself (Ioris 2014:10), in other words, the negative consequences of accumulation need to be curbed in a way that allows for more accumulation (Jessop 1977: 356-361). In this case study, the most demonstrative example of this have been the subsoil acts: Instead of banning the unecological farming of rice in the northern plains of India because the groundwater reserves are drying up, the local state authorities arbitrarily changed the time of planting and sowing, creating a new set of environmental issues through crop burning while simultaneously sustaining the lucrative rice-wheat farming cycle in the region. When the mitigation efforts are dislocated from the root cause of the issue like this, they will lead to action that is ineffective, partial, and temporary, and in the worst cases, creating new environmental issues down the road (Jessop 1977: 356-361).

But these same constrains that inhibit meaningful environmental action by the state can also be turned to opportunities as failures to mitigate pollution reflects wider asymmetries of balance of power within society, as well between the society and nature (Ioris 2014: 24-39). The state´s priorities can be reoriented again, just like they have been reoriented before. As the state feels the pressure to create fruitful

conditions for economic growth, it can concurrently feel a similar pressure to create the conditions for breathable and clean air. Therefore, the state is not only the primary environmental actor, but also the arena for contesting, bargaining, and compromising the nature of environmental action. The continuity, inventiveness, and contestation of environmental action is thus ultimately located within constrains and opportunities of the state.

Environmental policy is not created, nor implemented, in a vacuum: environmental statehood is a dynamic process that is in a constant transformation according to the different private and public pressures that are exerted on it through the balance of political power (Ioris 2014: 24, 26). To fully understand state environmental policies and their effects, it of utmost important to appreciate the context the policy is created in, not only looking into rationality of the measures, but their rationality in relation to the root cause of the issue.

Therefore, any tools that can empower residents and local organisations to put more pressure on local, state, and federal levels of government for more impactful mitigation action are invaluable. Available, open, and real-time data on pollution levels, like the OCEMS- monitoring systems measuring pollution from individual industrial units in Delhi, could offer great advantages. When the residents of a neighbourhood know exactly what quantity of harmful PM gets into their lungs daily, and from what sources, it must be easier to coordinate the needed civic action. One of the greatest ills of air pollution is its intrinsic saturation with ambiguity, it is very difficult to assess the regional, or local, effects of air pollution without a proper, and extensive, monitoring system. Visually, the finest particles are invisible to the naked eye, while the larger particles remain difficult to see in small to medium quantities. Normally, if you had anything in any given city that killed over 50 thousand people per year, it would be dealt with a great urgency, but because of the nature air pollution, these deaths fly systemically under the radar.

Additionally, the ability to properly monitor the regional, as well as local, levels of air pollution is closely tied to attaining policy coherence, something that has been absolutely lacking in the abatement efforts - demonstrated by the piecemeal approach to

mitigation action. The air pollution abatement goals must be conceptualised and pursued in a way that extends to other sectors, and policies in those sectors should be addressed for the sake of greater coherence, whether talking about the state procurement policies in Punjab and Haryana, or the rapid expansion of the registered fleets of cars on the roads of Delhi (Stocchetti 2013: 29).

Whilst the ability to properly observe these shared and quantifiable policy objectives – levels and sources of pollution – is mandatory for mainstreaming air pollution mitigation into other speres of related policy, the lack of policy coherence is not only from inadequate monitoring systems, the multiparty system of India can also complicate cooperation as exemplified by the constant finger-pointing and buck passing by the different parties in power in Delhi, Punjab, on federal level and in Haryana. On a more analytical level, policy coherence is impossible to attain if the main priority of the state is always growth and accumulation above everything else, as consistency and coherence in policy is the outcome of integrating shared policy goals within the formulation and implementation of policy. Clearly, air pollution mitigation is not a priority- or any kind of a goal - for many policies discussed in this thesis, such as the subsoil acts, consequently leading contradictory and incoherent policy.

In this study, the lack of coherence and the subsequent contradictions within environmental policies are both symptoms of the conflicting orientation the state has towards environmental action and accumulation. **When economic growth is placed above a sustainable relationship between humans and their environment, the outcome is an environment where neither humans nor other species, fauna, or flora, can strive**. This case is a prime example why the co-evolving metabolic relations between humans and their surroundings should dominate environmental discussions and policy (Foster 2000: 9-12).

The urban environment is transformed through the mobilisation of labour, and nature, in the process of capitalist accumulation, and as nature becomes more and more implicated in this process. The atmosphere around Delhi - and the NCR - is steadily degraded into a toxic dome of poison, and this dome in turn has a deep impact on humans, from their health to their economy (Swyngedouw and Kaika 2014:

470). From the monetary losses through lowered productivity and early retirement, and the following and ever-increasing healthcare costs, to the increased mortality from cardiovascular and respiratory diseases as well as from lung cancer (Kyung and Jeong 2020, WHO 2013:6). Children are robbed of the opportunity to play outside without possible health complications down the road, while the people living in slums, and in other places with no means to control the quality of the indoor air, have no other choice than to breath in the toxic air around the clock, leaving the most severe costs of air pollution to the most marginalised people within the city.

Economic standing remains the single most significant factor when measuring exposure to PM in Delhi and the NCR: the unprotected slums that mushroom near industrial units and other heavily polluted areas have no means to shelter themselves against the ever-encompassing air pollution while the formal housing prices by these polluted places are at the lowest (Kathuria and Khan 2007). The hierarchy of power and influence, differences in income and economic standing within the society, thus mirror the allocation of environmental and health hazards of air pollution in Delhi and its surrounding region (Swyngedouw and Heynen 2004).

Finally, the case of Delhi exemplifies how outdated the dichotomy of society and nature, and the dualism of anthropocentrism and ecocentrism, are in describing contemporary – or any historical - environmental issues. It is not a competition between different values of economy and nature, the foggy sky above Delhi during the winter is not an outcome of humans encroaching on nature, is the outcome of humans (re)producing the air through different economic activities, through which the atmosphere around Delhi is turned into a massive dumping ground for different chemicals, particles, dust, and gasses. Again, these evolving relations between humans and their environment need to take the forefront on ecological issues and green economics, instead of diminishing ecological challenges into a talk about values.

Utopian thinking must make way for reality: the energy and matter that goes into the economic system will transform (or degrade), and the return to the environment in an equivalent mass. Like many other contemporary environmental challenges, whether talking about global warming or mass extinction, air pollution mitigation

action is plagued by a similar blind faith in technological innovation. No matter how ambitious the regulation is for new cars in Delhi, or how often the registered cars are tested for their emissions, if the number of vehicles on the roads keeps on increasing year after year, so will their emissions. No matter how many innovative ways they can figure for the use of the leftover rice stalks that farmers burn off their fields, the fields will continue to burn if the root cause of the issue remains unaddressed. The conversation needs to shift from values and technological innovation into a talk about the intensity and scale of accumulation. Capital will continue to look for cheap sources of energy, raw materials, food, and labour, and the magnitude of this process will continue to have drastic effects on our environments from the air we breathe, to the soil the grow our food on.

At the forefront of this discussion is the degrowth movement, as the hegemonic green economic theory, green growth, does not seem to be feasible on a global scale. Empiric data suggests that absolute decoupling of GDP from resource use is possible, but only for the wealthiest nations. More alarmingly, according to the UNEP, contemporary trends show worse efficiency in resource use, with recoupling of GDP to resource use re-emerging again. The lowered efficiency in resource use has to do with rebound effects that stem from gains through cost reductions of goods or services, that consequently free up income and drive up the demand, leading to increased resource use. Therefore, gains in productivity lead to increased material demand through economic growth and these rebound effects (Hickel and Kallis 2019).

Degrowth answers this ecological dilemma through planned reduction of energy and resource use to balance the economy along with the environment in a way that reduces inequality and improves the well-being of humans (Hickel 2020). Although degrowth primarily focuses on the high-income nations, for example how they gain monetary surpluses – and claim decoupling resource use from GDP - through appropriating resources from the global South through ecologically unequal exchange (E.g., Dorninger et al. 2021), there are some lessons for developing economies like India. While the excess consumption and resource/energy use in the global North disproportionately damages the global South, driving developing nations to be exporters of cheap labour and resources instead of focusing on more human-centred economy,

there are also the questions of distributional equality. India´s economy has grown exponentially between 1980 and 2016, but over 30% of the population still lives below the 1.25 dollar per day poverty line, while the income shares of the richest 10% have increased by more than 20%, giving them 55% of all income generated in India (Spash 2020).

For future research, air pollution needs to be better included in the analytical discussions about the relationship between humans and their environments: there is a massive gap between the severity of this global health and environmental issue, and the analytical literature available on it. Aside from writers like Véron (2006) and Graham (2015), the politics and larger societal processes behind the issue of air pollution have been largely ignored. Looking at the demographic trends around the world, the issue of air pollution will continue gain importance into the foreseeable future, and hopefully the academic research will continue to critically examine the issue of air pollution and its relation to economic growth and public health and well-being. Moreover, air pollution epitomises the need in political ecology to lay more focus on the outputs of the economic systems (pollution), instead of solely focusing on the resources going in. As the laws of thermodynamics dictate, anything that goes in, must also come out.

To end, as depicted by this thesis, the state is the most important actor in designing, implementing, and supervising environmental policy, thus, to understand the failures, or success, of contemporary environmental action, it is mandatory to inspect the states part in it, from its arrangement of economic activities in the background, to the rationalisation and design of the environmental action itself. If the state remains the primary actor in implementing environmental policy, it should be at centre of environmental discussion.

The thesis likewise displays the inherent contradiction within state policy between differing priorities: the health of the citizens, and the environment, and the need for economic growth and accumulation. In this case study, this contradiction has manifested through environmental policies that are partial, ineffective, temporary, and provisional. The only time when air pollution mitigation action has not been relegated into a status of secondary importance has been when there is absolutely no other

option - at the point when the PM levels soar 12 times over the recommended 24-hour mean and people are literally struggling to breath.

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